The Centre for Social Development in Africa (CSDA), at the University of Johannesburg, was established in 2003 and is dedicated to basic, applied and strategic research in social development and developmental welfare. The CSDA aims to positively influence development issues in the Southern African region through contributing to debates on social policy, improvements in service delivery and the expansion of knowledge through cutting-edge research.

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List of acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>BMI</td>
<td>Body Mass Index</td>
</tr>
<tr>
<td>CSDA</td>
<td>Centre for Social Development in Africa, University of Johannesburg</td>
</tr>
<tr>
<td>DBE</td>
<td>Department of Basic Education</td>
</tr>
<tr>
<td>GHS</td>
<td>General Household Survey</td>
</tr>
<tr>
<td>ISAK</td>
<td>International Society for the Advancement of Kinanthropometry</td>
</tr>
<tr>
<td>NSNP</td>
<td>National School Nutrition Programme</td>
</tr>
<tr>
<td>SANHANES</td>
<td>South African National Health and Nutrition Examination Survey</td>
</tr>
<tr>
<td>TBF</td>
<td>The Tiger Brands Foundation</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
</tbody>
</table>

Definition of key terms

Stunting
Between two and three standard deviations below the median range for height-for-age

Severe stunting
More than three standard deviations below the median range for height-for-age

Underweight
Between two and three standard deviations below the median weight-for-age

Severely underweight
More than three standard deviations below the median weight-for-age

Wasting
Between two and three standard deviations below the median BMI-for-age

Severe wasting
More than three standard deviations below the median BMI-for-age

Overweight
Between one and two standard deviations above the median BMI-for-age

Obese
More than two standard deviations above the median BMI-for-age

Executive summary

School nutrition programmes are widely regarded as excellent interventions to improve the health and wellbeing of children living in poor circumstances. They reduce short-term hunger, improve children’s linear growth, lead to more effective short and long-term learning at school, mitigate children’s vulnerability to stunting, and help manage cognitive delays associated with malnutrition. They may also help to protect children from childhood and adult obesity associated with early stunting and the overconsumption of low-nutrient foods. In the long-term these gains are believed to have economic, health, and human development benefits for the population at large.

South Africa’s National School Nutrition Programme (NSNP) delivers a cooked lunch consisting of a starch, a protein and a vegetable, to all Quintile 1 – 3 schools nationally. These schools service the most deprived communities in South Africa. The NSNP reaches approximately 8.8 million poor children daily. The recently introduced Tiger Brands Foundation (TBF) nutrition programme delivers breakfast in the form of fortified cooked porridge to approximately 30,000 children nationally, primarily in Quintile 1 and 2 schools. TBF is a private foundation working in partnership with the state in all nine provinces to offer this programme. The NSNP is the second largest state investment into the health and welfare of children, after the Child Support Grant, and it has never been assessed for its impact on anthropometric outcomes, learner performance and learner attendance. The TBF in-school breakfast feeding programme was evaluated at its pilot stage (Hochfeld, Graham, Peters, Patel, Nyathiela, Moodley, 2013), but not since it has been substantially expanded. This study represents the first attempt to evaluate the outcomes of such programmes, and to assess their effects relative to one another. The findings point to the positive and protective effects of both programmes. Such gains should be celebrated but also need to be corroborated and tested further. Nevertheless this is a good story that needs to be told.

The study
This study took place in the district of Lady Frere – one of the poorest rural areas of the Eastern Cape. It comprised a comparative research design in which results from two groups – schools receiving only the NSNP and schools receiving both the NSNP and the TBF in-school breakfast feeding programme – were compared. In addition results from both comparison groups were compared to a control group – schools in the Gqumbu district that had been re-unified from quintile 4 to quintile 3 schools and therefore qualified to begin receiving the NSNP. A natural pre- and posttest occurred in the study in that the control schools started receiving the NSNP in the second term of 2014. We were therefore able to collect baseline data as well as follow up data five months after they began receiving the meals from learners at these schools.

The story that emerges from these schools is a very positive one.

Wasting and stunting:
• Despite high levels of poverty in the district, children at all of the schools showed lower rates of underweight and wasting than the Eastern Cape provincial averages for children. This is in part explained by the fact that the provincial averages are for children 0 – 15 years and the highest levels of undernutrition are for children 0 – 3 years (Shisana et al., 2012). Once children reach school they are benefiting from the NSNP.
• With regard to height-for-age, data children in the schools receiving both nutritional interventions and those in the relatively better off control schools had low stunting rates (9% and 6.5% respectively) when compared to the national average for learners aged 4-14 years of 13% (Shisana et al., 2014).
• Those at the schools receiving the NSNP only had somewhat higher stunting rates (14.5%) than children at the control schools and those received the TBF breakfast. This latter figure is in fact in line with the national average but is far lower than the average for children 0 – 5 years in the Eastern Cape (23%) (Shisana et al., 2014).

The differences between learners at schools receiving the breakfast and those receiving only the NSNP suggest that the addition of a nutritious breakfast can positively shift stunting levels. Such a finding requires further research for conformation as there is some debate about the intractability of stunting over the life course of a child. However, evidence from the Tiger Brands Foundation breakfast pilot study conducted in Alexandra shows that...
levels of severe stunting were reduced by 4.7 percentage points over a ten month period (Hortof, 2013). The data from both the Lady Frere and the Alexandra studies is cause for optimism although further research is required to confirm this finding.

Overweight:

- The second major finding relates to the protective effects of both programmes on overweight and obesity. In South Africa we have a growing obesity problem with implications for the national disease picture in South Africa – on top of conditions of undernutrition such as kwashiorkor and oedema, obesity drives a second layer of noncommunicable diseases such as diabetes, hypertension, and cardiovascular problems.
- However, children at both the comparison group schools were significantly less likely to be overweight or obese when compared to the learners at the control schools.
- In addition, learners at the schools receiving both nutritional interventions were significantly less likely than those receiving only the NSNP to be overweight or obese. These effects were particularly strong for girls.
- Further, the data from the control schools show that once learners start receiving the NSNP there is a reduction in overweight rates. Although further research is needed to understand this change it does seem to confirm the protective effects of the NSNP for overweight and obesity in children.

Learner performance:

- Children at the schools receiving the NSNP had higher marks than those at control schools in both the first and the last term. Children receiving the breakfast had higher marks at both points in time than either those at the control or the NSNP onl y schools.
- Although school performance is shaped by a myriad of factors and cannot be attributed solely to the interventions it is clear that children receiving meals during the day are doing better.
- Educators and principals at the schools are very clear about the positive effects on learning that the meals have. They note that children concentrate better and participate more during class after eating. These benefits accrue from the start of the school day for learners at schools receiving both the breakfast and the NSNP lunch.

Other benefits:

- Stakeholders identified a number of other benefits of the feeding programmes, including infrastructure and skills development at schools; the development of local gardens at schools; the opportunity for food handlers to earn a stipend; community and family benefits when surplus food is given to vulnerable learners to take home; improved nutrition literacy, and increased knowledge of hygiene among learners.
- School stakeholders felt very positive about the complementarity of the TBF and NSNP programmes, and also mentioned other useful partnerships brought onboard through these programmes.

Conclusions

The study provides strong support for the continuation of the NSNP in quintile 1 – 3 schools in the Lady Frere district. This significant state investment needs to be recognised for the impact it is having on protecting children from the effects of poverty as well as the potential long term effects it will have on health and economic prospects.

In 2012, 66 million children throughout the developing world attended school hungry (World Food Programme, 2012). Nutritional deprivation in childhood can have severe and long lasting negative effects on the physical and intellectual development of children (Ajuebor, Carter & Woolard, 2006). Without adequate nutrition from birth throughout childhood, many children will not fulfil their intellectual, physical, social, and, later, their employment potential (Ladoaba, Jemis, Steyn, Gericke, Maunde, Davids & Parker, 2011; Ruel & Alderman, 2013; Singh, Park & Dercon, 2013; Jomaa, McDowell & Probst, 2011; Ivenson, de Plessis, Morais, Marste, Haase-Kiers & Hesselman, 2011; Vorster, 2010). Globally, high levels of poverty, inequity and discrimination constitute the key barriers to adequate nutrition for many children (Ivenson et al., 2011: 72).

It is well recognised that improved nutrition in childhood has protective effects not only for the child’s future, but also for whole societies in the long term as it produces positive social and economic returns (Eleuwere & Sables/Wheeler, 2011; Ajuebor et al., 2006; Wool, 2006). School nutrition programmes are widely praised as an effective way to reduce short term hunger and to invest in children’s long term nutritional health (Gill, 2010; Adelman, Gilligan & Lehrer, 2008). In addition, they have important social and achievement effects, such as improved school enrolment, attendance, and achievement in terms of test scores, improved attention span, memory, and cognitive, psychomotor and mental development (World Food Programme, 2009; Bundy, Bubano, Gosh, Gill, Jukes & Drake, 2009; Briggs, 2008; World Health Organization, 2007; Bennett, 2003; Bih, undated).

Despite the fact that South Africa is a middle income country, poverty and food insecurity remain a major challenge due to the country’s stark inequality. According to the South African National Health and Nutrition Examination Survey (SANHANES) conducted in 2012, 26% of the population experience hunger, with a further 28.3% of the population classified as being at risk of hunger (Shisana et al., 2014: 10).

The population of children between the ages of 0-18 living in South Africa is somewhere around 18 million (Statistics South Africa, 2013b: 5). The South African Department of Basic Education delivered one meal through these programmes in schools. The protective effects of the NSNP for overweight and obesity in children.

The National School Nutrition Programme (NSNP) is a state funded nutritional intervention in all nine provinces which feeds 8.8 million needy children a meal every school day. (Department of Basic Education, 2014). The South African government allocated R5.2 billion in conditional grant transfers to provinces for the NSNP in the 2013/2014 financial year (Republic of South Africa National Treasury, 2015:46). The intervention provides one midday meal consisting of one protein, one starch, and one vegetable, chosen according to a nationally developed menu with

1. The National School Nutrition Programme

The National School Nutrition Programme (NSNP) is a state

<table>
<thead>
<tr>
<th>1994 (6)*</th>
<th>1999 (1-9)</th>
<th>2005 (1-9)</th>
<th>2012 (0-9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stunting</td>
<td>25%</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>Underweight</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Overweight</td>
<td>No available data</td>
<td>20%</td>
<td>14%</td>
</tr>
</tbody>
</table>

*Columns one and four are limited by the different age ranges used
** Reported for children aged 2-9 years
Source: (Ivenson et al., 2011; Shisana et al., 2014)
They currently provide a daily breakfast during term time to improve nutrition for learners in no-fee primary schools.

Diets that are characterised by refined foods and low protein intake (Taljaard, Covic, Van Graan, Kruger & Jerling, 2013). Some studies have shown associations between breakfast consumption and reduced risk of cardiovascular disease, some benefits include improved nutrient intake and diet quality and reduced dropout rates (Hochfeld et al., 2009; Bundy et al., 2009). By the end of apartheid, child hunger amongst the ‘neediest’ children; however, only white children benefited (Swartz, 1996 in South Africa. They were aimed at the ‘neediest’ children; however, only white children benefited (Swartz, 1996). By the end of apartheid, child hunger amongst the ‘neediest’ children; however, only white children benefited (Swartz, 1996). By the end of apartheid, child hunger amongst the ‘neediest’ children; however, only white children benefited (Swartz, 1996). By the end of apartheid, child hunger amongst the ‘neediest’ children; however, only white children benefited (Swartz, 1996). By the end of apartheid, child hunger amongst the ‘neediest’ children; however, only white children benefited (Swartz, 1996). By the end of apartheid, child hunger amongst the ‘neediest’ children; however, only white children benefited (Swartz, 1996). By the end of apartheid, child hunger amongst the ‘neediest’ children; however, only white children benefited (Swartz, 1996). By the end of apartheid, child hunger amongst the ‘neediest’ children; however, only white children benefited (Swartz, 1996).

All primary and secondary schools that are categorised as Quam 1 – 3 (most deprived schools) take part in the NSNP. Province departments also partner with organisations to ensure that they are able to effectively monitor progress and to support schools in implementing the programme. Furthermore, officials assess schools’ readiness to implement feeding in the coming year (Department of Basic Education, 2014: 28). The current research focuses on the impact of the school feeding programmes of the TSNP and TBF, in an area different to the urban setting of the pilot study. In 2013 the TBF model of partnering with the NSNP and engaging in community consultation was shown to be effective and positive.

Since the pilot phase, TBF has expanded their programme considerably to cover primary and combined schools in eight provinces. The TBF model of partnering with the NSNP and engaging in community consultation was shown to be effective and positive.

The overall aim of the research was to evaluate the impact of the School Nutrition Programme (NSNP) and the Tiger Brands Foundation in-school breakfast feeding programme in an area different to the urban setting of the pilot study. In 2013 the TBF model of partnering with the NSNP and engaging in community consultation was shown to be effective and positive.

Secondary objectives related to this aim were to:

• Determine whether there were school development benefits associated with the programmes.
• Determine whether there were broader social benefits associated with the programmes.
• Identify key areas of challenge related to the programmes in order to recommend areas for improvement.

It should be noted that despite the reach of the NSNP, the programme has never been evaluated for impact. The partnership with TBF has allowed this to happen for the first time.

In 2013 the CSDA completed an evaluation of the pilot phase of the TBF school breakfast programme. This research was conducted in six pilot primary and combined schools in Alexandra Township in Johannesburg over the period July 2011 – June 2012. The findings showed that all six of the schools there were positive measurable impacts on nutrition, school performance and school attendance among the learners. However, the study could not differentiate impacts of the NSNP and the TBF, interventions as all pilot schools were also receiving the NSNP. Principals and other school stakeholders also reported positive school impacts and broader social benefits (Kroeks, et al., 2013). The TBF model of partnering with the NSNP and engaging in community consultation was shown to be effective and positive.

1.2. The Tiger Brands Foundation in-school breakfast feeding programme

Breakfast is thought to have positive effects on immediate cognitive performance and feelings of well-being. Long-term benefits include improved nutrient intake and diet quality and some studies have shown associations between breakfast consumption and reduced risk of cardiovascular disease, diabetes and more effective weight management (O’Neill, Byrd-Bredbenner, Hayes, Jana, Klinger & Stephenson-Martin, 2014). One of the reasons that breakfast consumers tend to have higher micronutrient intakes is partly due to breakfast cereal and porridge fortification (Hoyland, Dye & Lawton, 2009). Mineral iron is often missing in diets that are characterised by refined foods and low protein intake (Taljaard, Covec, Van Graan, Kruger & Jerling, 2013).

The Tiger Brands Foundation established its in-school breakfast feeding programme in 2011 in order to contribute to improved nutrition for learners in rural primary schools. They currently provide a daily breakfast during term time to almost 41,246 learners in eight provinces in South Africa. Therefore learners in schools participating in the TBF school feeding programme are receiving two meals per day at school: breakfast provided by the TBF and a second meal provided by the NSNP. The TBF programme is an example of a successful public-private partnership aimed at improving the lives of poor children in South Africa.

Promote and support food production and improve food security in school communities, and

Strengthen nutrition education in schools and communities (Department of Basic Education, 2014: 151).

The intended result of the NSNP is improved educational outcomes for individual learners as well as the country as a whole, while the social development and health effects of this intervention have positive impacts far beyond education alone. It is thus considered a key social investment of the state. Nevertheless, due to the high rates of unemployment and poverty in South Africa, the NSNP has reduced but not eradicated child hunger (Pali & Wright, 2011).

All primary and secondary schools that are categorised as Quam 1 – 3 (most deprived schools) take part in the NSNP. Province departments also partner with organisations to ensure that they are able to effectively monitor progress and to support schools in implementing the programme. Furthermore, officials assess schools’ readiness to implement feeding in the coming year (Department of Basic Education, 2014: 28). The current research focuses on the impact of the school feeding programmes of the NSNP and TBF, in an area different to the urban setting of the pilot study. In 2013 the TBF model of partnering with the NSNP and engaging in community consultation was shown to be effective and positive.

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2. A review of the literature: childhood nutrition and school feeding programmes

Food insecurity is a major global concern, which is why goal number two of the Sustainable Development Goals aims to end hunger, achieve food security and improve nutrition, and promote sustainable agriculture (United Nations, 2015). According to the Food and Agriculture Organization (Food and Agriculture Organization, 2016), 821 million people go hungry every day. This is an estimated 1 in 9 people. The UN declares that one in three people does not have access to a nutritious diet (World Food Programme, 2017).

2.1 Nutritional deficits in children

Africa is home to 23 million children who are persistently hungry as they live in food insecure households (World Food Programme, 2011). Poor nutrition has both short- and long-term impacts. In the short-term children without adequate nutritional intake lack energy, and concentration and therefore their ability to play (particularly important for younger children) and work or school is compromised. Children who do not eat regularly also have difficulties with the recall of new information, and verbal fluency (Bennett, 2003 in Tomlinson 2007). Vaisman, Voet, Akivis and Vakil (1996) reveal that shortly after a meal children performed significantly better on various cognitive activities. Childhood stunting therefore plays an important role in helping children learn. In addition, in times of environmental or socio-economic crisis, children often withdraw from school to contribute to household income, and a school meal provides an incentive for these children to attend school in difficult times (Singh et al., 2013; Tomlinson, 2007).

As children who are not adequately nourished do not reach their developmental milestones at the right age and their achievements remain behind their age groups, longer term impacts of poor childhood nutrition include a lack of attainment of intellectual and physical potential which leads to restricted livelihood and educational opportunities. Childhood stunting has been shown to impact physical and intellectual human capital, which in the longer term is associated with increased earnings as adults, particularly in countries which depend on industry which is labour intensive (Victora, Adair, Fall, Hallal, Martorell, Richter, Sachdev, 2008).

There are complex associations between stunting as an outcome of poor nutrition and obesity. In 1996, Popkins, Richards and Monteiro noted that there was a strong association between stunting and overweight and obesity in the same children across four countries. While in the South African context evidence of an association between stunting and poor weight management (Iverson et al., 2004), poor nutrition in childhood and thus Poor nutrition in childhood therefore contributes to the intergenerational cycle of poverty and deprivation.

On the other side of the nutrition coin is the challenge of obesity, which is fast becoming a worldwide burden affecting rich and poor populations (The Maternal and Child Nutrition Management Group [MCH-Sci], 2013). In the developing world, obesity is increasing due to low quality diets high in fat, starch, sugar, salt and low in nutritional benefits. A Discovery Vitality report titled “Healthy active kids report card 2014” shows that, according to the VHI, 23% of girls and 10% of boys aged 10-14 years are overweight or obese which totals approximately 44 million children globally. As many as 10 million of these children are in Africa. Staple food in most parts of the world consists of starch, such as maize meal in South Africa. An overconsumption of starch in relation to other food types is a survival strategy in income constrained environments, but it contributes to a rise in overweight populations, particularly when it is not sufficiently supplemented by high-nutrient vegetables and fruit (Temple & Steyn, 2011). A study by Jacobs (2009) shows that a low quality food basket, high in salt, fats and refined carbohydrates is cheaper than a nutritious basket of goods. This means that people living in poor contexts are likely to be consuming the foods that drive obesity, which in turn contributes to increased risk for the non-communicable diseases discussed above. People who are overweight or obese run much higher risks of non-communicable diseases. Obese and overweight children run higher risks of being overweight and obese adults, with increased risk for the concomitant diseases of obesity such as cardiovascular diseases, mainly heart disease and stroke, diabetes, musculoskeletal disorders, especially osteoarthritis, and cancers of the endometrium, breast and colon (WHO, 2012: 1). Given the above discussion on stunting and its relationship to obesity and non-communicable diseases, what emerges is a complex interaction between undernutrition in childhood and low quality nutrition driving obesity and in turn vulnerability to non-communicable diseases.

A major complexity in low and middle income contexts is the changing nature of people’s food security environment and nutritional habits over their life course. Individuals can often grow up in rapidly changing socio-economic environments which can result in shifts from poor early life nutrition, causing stunting, and then a later diet that contributes to obesity and chronic disease risk (often related to urbanisation or improved economic circumstances) (Adair, 2013). Researchers say that in such contexts more longitudinal studies are important (Adair, 2013).

What is clear is that we have a growing obesity problem in South Africa and this is in line with the now established trend of multiple nutrition burdens globally: of all countries which have nutrition data, 43% have both undernutrition and overweight problems (IFPR, 2014). The double burden of malnutrition has implications for the national disease picture in South Africa. As shown in other parts of the world with both undernutrition and overweight problems, this combination creates, on top of conditions of undernutrition such as kwashiorkor and rickets, a second layer of diseases that until quite recently was mainly confined to the developed world: diabetes, hypertension, and cardiovascular problems such as strokes being the most common (Haddad, Cameron, & Barnett, 2014). South Africa is already feeling the costs of this double burden.

Worryingly, global evidence on the rise of obesity and its related health problems in the developing world show that “people of lower social and economic positions fare worse [than those with better standards of living].” Vulnerable and socially disadvantaged people get sicker and die sooner as a result of NCDs (non-communicable diseases) than people of higher social positions (WHO, 2014: 2). In addition, the costs to healthcare systems from NCDs are high and projected to increase. Significant costs to individuals, families, businesses, governments and health systems add up to major macroeconomic impacts. Economic analysis suggests that each 10% rise in NCDs is associated with 0.5% lower rates of annual economic growth (WHO, 2014: 3).

South African data does indicate, though, that obesity levels are not completely static for individuals, even though we know the national rate is on the rise. Arndt and Gossadontse (2012) note that there are considerable transitions into and out of obesity when comparing wave 1 and wave 2 at the National Income Dynamics Dataset (a period of approximately two years). For example, over half of the men who were classified as obese in wave 1, were no longer obese two years later. This might be due to increased height during normal growth (transiting individuals were mainly younger), but also could indicate the possibilities of movement out of obesity for younger people. As such there is unfortunately very limited data on transitions into and out of obesity for children.

Related to overconsumption of starchy foods low in nutritional value is a phenomenon known as “Hidden Hunger”, or micronutrient deficiency. This phenomenon affects children who seem to be well fed or do not experience severe hunger, but are nonetheless not receiving adequate intake of the right micronutrients for optimal growth and development. There are distinctive clinical features of hidden hunger that can present in normal-weight overweight and obese children (Knorr, 2010). A common micronutrient deficiency found in children from poor backgrounds is iron - which can lead to anaemia; a well-known cause of poor cognitive functioning (Richter et al., 1997: 93).
As “nutrition is foundational to both individual and national development”, under- and over-nutrition in children causes poor child development which ultimately affects the globe’s human capital formation (MCNSG, 2013: 2, Broca & Stannouli, 2003, Jomos et al., 2011). Globally, obesity among children and adolescents is increasing alarmingly, and data suggests this trajectory is set to continue in the medium-term (Pigg et al., 2014) with the concomitant growth in health risks for individuals and public health costs for states. Overall, therefore, poor nutrition leads to poorer social development and outcomes for individuals, their families, and their communities.

2.2 Determining poor nutrition

As discussed above, poor nutrition is not simply the result of lack of sufficient food, but is also related to intake of poor quality foods that are nutritionally deficient. For this reason a range of indicators should be used to assess poor nutrition. Definitions of key indicators of poor nutrition are provided below.

Underweight: Children who experience medium to long-term under-nutrition weigh too little for their age and height. Underweight children and severely underweight children are at the greatest risk of mortality. Weight-for-age is used to assess whether children are underweight. Children who are two to three standard deviations below the median weight-for-age are classified as underweight and those who are more than three standard deviations below the median are severely underweight. Weight-for-age only applies to children up to the age of 10 years, after which puberty skews weight-for-age results.

Wasting: Acute under-nutrition in children is indicated by wasting – the result of insufficient nutrient intake or if a child is experiencing some form of illness like diarrhoea. It is also common in times of famine or other food security crises. Improved immune system function is a common symptom of wasting, which can lead to increased susceptibility to illness, infectious disease and ultimately increased risk for death. South African children are generally not at risk for wasting except in cases of serious illness. Wasting is measured by the BMI-for-age indicator. Children who are two to three standard deviations below the median height for their age are classified as stunted and those who are three or more standard deviations below are classified as severely stunted (WHO, 2007).

Overweight or obese: A child who weighs too much for his or her age and height is classified as either overweight or obese. Being overweight or obese is measured by Body Mass Index (BMI-for-age). Children who are between one and two standard deviations above the median are classified as obese (WHO, 2007). BMI-for-age has been critiqued for not being an accurate measure of obesity, especially for children who have reached puberty, as other anthropometric features such as muscular-skeletal make-up are not taken into account. For this reason BMI-for-age measurements can be complemented with body fat percentage indices and the maturity index.

2.3 Nutritional deficits in South African children

Data on the nutritional status of children in South Africa reveals the combined problems of underweight and levels of obesity. The South African National Health and Nutrition Examination Survey (SANHANES-1) reported that in 2012, for children aged 2 – 14 years, “the prevalence of stunting was 15.4%, of severe stunting, 3.8%, of wasting and severe wasting 2.9% and 0.8% respectively, and of underweight and severe underweight 5.8% and 1.1%” (Shisana et al., 2014: 207). The prevalence of children being overweight or obese was the highest at 28.10%.

Four national studies have been conducted since democratisation which highlights the nutritional status of children in South Africa: the nationwide South African Vitamin A Concentrated Drops Project (VACDP) which was conducted in 1994, the National Food Consumption Survey (NFC), the National Food Consumption Survey/Fortification Baseline (NFC/FSB) in 2003, and the SANHANES -1 of 2012. Findings across all four studies spanning the last 20 years reveal:

- There is disparity between children living in rural and urban areas in terms of nutrient deficiency, with children in rural areas being more deprived than those in urban areas.
- Rates of stunted and underweight children have decreased.
- Prevalence of children being overweight or obese is of concern.

Undernutrition and stunting in children was found to be most persistent in rural farming, tribal and urban informal areas (Shisana et al., 2014). According to Ruel and Alderman (2013), South Africa has unacceptably high rates of stunting based on the country’s relatively high income level. In addition, the coexistence of undernutrition and obesity is also identified as being a particular problem in South Africa, affecting especially the black population and those living in rural areas (Iverson et al., 2011: 74). Stunted children experience obesity at twice the rate of children who are of the appropriate height for their age (Iverson et al., 2012:7:20). Stunted children’s obesity rates are twice that of children who are the appropriate height for their age. Obese children are more likely to develop many of the disease outcomes related to under-nutrition and obesity.

According to Bradshaw et al. (2006 in Vorster, 2010: 2), “South Africa has high prevalence of both infectious diseases related to under-nutrition and of non-communicable diseases (NCDs) related to obesity and over-nutrition”. In South Africa obesity related diseases began to emerge before disease associated with under-nutrition was eradicated. This phenomenon is in part caused by “toxal malnutrition and low quality of staple food diets (sufficient energy but not enough micronutrients) in poor households” (Vorster, 2010: 2). It is well documented that micronutrient deficiency in poor South African households is caused by the shift from traditional diets rich in whole grains to more “Western” diets characterised by starch and refined sugars (Iverson et al., 2011).

A study published in 2010 revealed that a high percentage of the rural population source their food from large supermarket chains that are predominantly stocked with processed foods (Temple & Steyn, 2011: 807). This study also revealed that in order for an average family of five in the Western Cape to purchase healthier foods, they would need to spend an extra $100 per month. This amount is simply not affordable for most families. In this context it becomes necessary not only for nutrition programmes to provide learners with a meal, but to provide nutrient rich meals.

Micronutrient deficiency in South African children is directly linked to the quality of food made available to them. The growth patterns of a child are disrupted when the value and amount of food consumed is poor (Oosthuizen, Oldewage-Thomas, & Krugers, 2013). The average South African consumes a predominantly cereal based diet with limited amounts of animal protein and Vitamin A enriched fruits and vegetables. Under-nutrition and over-nutrition are also a consequence of diets with lack diversity (Labadarios, Steyn & Maundu, 2000; Fabar, Laurie, Maduna, Maguthule & Muelhoff, 2013; Labadarios, Steyn & Nel, 2011; Temple & Steyn, 2011). As such the nutrient density of the diet consumed by South African children does not meet their nutrient requirements. According to Shisana et al. (2014:240), fortification programmes have been introduced to try and curb micronutrient deficiency, however these programmes have not significantly improved dietary diversity or micronutrient intake. Hence, stunting continues to affect a proportion of South African children.

The policy implications of these four studies highlight the need for interventions aimed at promoting nutrient diversity to address the dual problem of under-nutrition and obesity. Ruel & Alderman, 2013; MCNSG, 2013; Shisana et al., 2014: 21-213). In addition, Labadarios et al. (2011: 3) suggest that no national survey covering all the dimensions of food insecurity in South Africa exists. Such a study could aid in dealing with this new landscape of underweight and overweight children.

2.4 The role of school feeding

In 2013 it was estimated that the global annual investment in school feeding was between US$47 billion and US$75 billion – most of which is from government budgets. This investment makes school feeding the biggest social safety net worldwide (WFP, 2013: 14). School feeding has a long history in the developed world. In Europe school feeding initiatives extend as far back as the 1890s (Fenderson, 1971). In the developing world India has what is regarded as the biggest and most successful school feeding programme worldwide. By 2003 most states in India were providing children with a cooked meal daily. Known as the Midday Meal Scheme (MDMS), this programme had managed to feed 120 million school children daily (Tomlinson, 2007). Within the Southern Africa Development Community (SADC), there are a number of school feeding programmes, often funded in part or fully by international donors. For example, Malawi has what is regarded as an effective school feeding programme (Mueller, Downen, Richardson, Chima, & Walle, 2014) called Food for Education (FFE). It aims to reduce short-term hunger, improve food intake, and promote learning by providing school children with an in-school snack or meal daily (Tomlinson, 2007).

School meals have various positive effects. Aside from reducing short-term hunger, one of the key objectives is to incentivise children to go to school. One daily meal has the...
The NSNP has potentially highlighted public awareness about the importance of nutrition in a growing child’s life (Budlender & Lund, 2008). In addition, there are anecdotal accounts of improved school attendance and classroom attendance thanks to the NSNP (Liversen et al., 2011: 73). The NSNP has also been said to play a role in ensuring gender equality in access to education. It has been argued that school nutrition programmes encourage adolescent girls to remain in school, delay first pregnancy, address HIV risk factors and improve adolescent girls’ nutrition knowledge and micronutrient status, to prepare them for motherhood (Riel & Alderman, 2013). Adolescence has been identified as the second most important growth phase after early childhood. Therefore including secondary schools in the programme has the potential to be more effective and long lasting – extending into adulthood – preventing adult obesity and ensuring healthier offspring (Ali-Almae, 2005 in Shisana et al., 2014: 239).

There is much international and local debate surrounding the efficacy of school feeding in terms of implementation, as well as the impact such programmes may have on academic performance and nutritional outcomes (Singh et al., 2013; Richter et al., 2013; Budlender & Lund, 2008). A systematic review of school feeding and its impact on obesity in particular, (James and Lock, 2008) comment that few large scale studies have been evaluated globally, and, in any event, evaluations are focused on the improvement of the food environment and dietary intake in schools rather than on evaluation of their impact on BMI.

In the spirit of programme evaluation it would be pertinent to assess whether or not initiatives like the National School Nutrition Programme are focused on the improvement of the food environment and dietary intake in schools rather than an evaluation of their impact on BMI.

School feeding is largely uncontroversial and relatively simple to implement, and therefore it is a popular form of social security or ‘safety net’ acting as an income transfer for the household as a whole, helping families to educate their children, and protect them from the stress of poverty in times of crisis. Across the developing world school meals help mitigate nutrient deficiencies which directly impact the health, well-being and future productivity of school-going children. School meals also have the ability to target the most vulnerable members of the population such as orphans and children from single parent or grandparent headed households (MVP, 2013).

External evaluation of certain aspects of primary school feeding programmes is warranted, but this assessment would have to be based on an evaluation of the performance of the government’s programme in principle and not on the actual planning and implementation of the programme. It has been argued being ‘delivered’ because provinces were politically motivated to target as many schools as possible and therefore spread resources thinly. The end result was an ‘under provision of meals in quantity and quality’. It was recommended that management of the programme be transferred to the Department of Education from the Department of Health.

Food for Thought: A Review of the National School Nutrition Programme (2005). This review looked specifically at how the National School Nutrition Programme is targeted at schools and learners, with a specific focus on the budget for the programme, an overview of the targeting of the programme and an evaluation of the targeting mechanism. It concluded that the NSNP was regressive because 4.3 million children were being targeted and this number was in decline as the Department of Education had no intention of increasing the number of children benefitting from the scheme. Administrative and management problems continued to be a hindrance to effective implementation as well as the fact the no comprehensive nutritional surveys had been conducted detailing the nutritional status of South African children. This study also reported that one daily meal at school on its own was not enough to meet the daily nutritional needs of school-going children.

The South African School Nutrition Programme: Formative Evaluation (2006). This study was conducted in May 2005 by Richter et al. (2005; Singh et al., 2013). This lacuna is in part due to challenges in assessing the effects of such programmes. Studies conducted in developing countries have struggled to identify the effects of school feeding programmes in relation to other factors that are socioeconomic, cultural or educational in nature. Evaluators in developing countries have not been able to identify challenges such as inadequate administration as this factor can affect the reliability of findings (Richter et al., 1997).

Despite the above challenges the NSNP has been the subject of inquiry for some time with six comprehensive studies having been conducted. It must be noted that all six of those identified were specifically focused on the middle income status, under-nutrition remains a key challenge. It is clear that in-school feeding programmes are critical based interventions available to policymakers in developing countries, particularly when mitigating the nutritional effects of crisis. Across the developing world school meals help mitigate nutrient deficiencies which directly impact the health, well-being and future productivity of school-going children. School meals also have the ability to target the most vulnerable members of the population such as orphans and children from single parent or grandparent headed households (MVP, 2013).

The end result was an ‘under provision of meals in quantity and quality’. It was recommended that management of the programme be transferred to the Department of Education from the Department of Health.

The purpose of the evaluation was to determine whether the Tiger Brands Foundation’s in-school breakfast feeding programme and the challenges associated with such programmes by both these programmes on the outcomes of and learning from the programme. The overall finding of this study was that the Tiger Brands Breakfast Feeding Programme is critical to the provision of a meal at school at no cost to the parents or guardians and ensuring that the school feeding programme is sustainable in a country where child poverty is still widespread. It concluded that the NSNP is regressive because 4.3 million children were being targeted and this number was in decline as the Department of Education had no intention of increasing the number of children benefitting from the scheme. Administrative and management problems continued to be a hindrance to effective implementation as well as the fact that no comprehensive nutritional surveys had been conducted detailing the nutritional status of South African children. This study also reported that one daily meal at school on its own was not enough to meet the daily nutritional needs of school-going children.

The South African School Nutrition Programme: Formative Evaluation (2006). This evaluation was intended to guide the planning processes for each larger, national evaluation by identifying key themes and dynamics at the local level. It stated that while the NSNP impacted positively on school-going children’s lives in general, it was clear that the need for additional support to specific areas of the programme. The evaluation was intended to provide an overview of the effective implementation of the programme; and provide recommendations in terms of the effective implementation of the programme. The programme concludes that schools in both provinces seemed to not have adequate infrastructure and facilities to implement the NSNP effectively and successfully. The evaluation also concerns about the capacity of the local food suppliers and again several cases of non-delivery, delays in delivery and delivery of wrong or poor quality food were reported in both provinces (The Public Service Commission, 2008: xiiiv).

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3. Research design and methodology

The study employed a mixed methods approach. The core component of the study took the form of a comparative research design (Langston, 2005) aimed at assessing the relative impacts of the programmes. In addition, a pre-and posttest was introduced because the control schools were not allowed to start receiving the NSNP during the course of the study. It was therefore pertinent to ascertain whether these schools experienced any changes after receiving the intervention. This introduced a quasi-experimental component to the design. The comparative design was complemented by a qualitative component, the aim of which was to explore perceptions of the contribution of the programmes and the challenges that schools faced with the programmes.

A comparative research design is operationalised by selecting at least two communities that demonstrably vary with regard to some variable(s) prior to the conduct of the research (Campbell and Stanley, 1965). This particular study involved two comparison groups and a “control” group with the independent variables being the presence or absence of the NSNP programme, and the presence or absence of the TBF in-school breakfast feeding programme.

Comparison group 1 consisted of Quintile 1 – 3 schools in receipt of the NSNP lunch but not in receipt of the TBF breakfast. Comparison group 2 consisted of Quintile 1 – 3 schools in receipt of both the TBF breakfast and the NSNP lunch (TBF+NSNP schools). While there were no Quintile 1 – 3 schools that did not receive the NSNP lunch, some schools in the province had been re-quantified taking into account their level of disadvantage. Of these re-quantified schools in the Eastern Cape, two schools in Gumbi district were fairly similar to the Lady Frere schools under study in relation to demographics and location in a rural area. These re-quantified schools served as a “control” group against which to compare the comparison groups. Other re-quantified schools were either in urban areas or apparently less disadvantaged. Therefore did not qualify as a control group for this study.

In effect the inclusion of all these types of schools allowed for the following comparisons:

- TBF+NSNP schools could be compared to NSNP/only schools to ascertain whether the addition of a breakfast programme had any effect.
- NSNP/only schools could be compared to the control schools to ascertain whether the inclusion of a lunch meal had any effect.

In addition, it should be noted that a natural pre-posttest occurred in the course of the study as the required schools began receiving the NSNP lunch in the second school term of 2014, which was after the first measurement and a few months before the second measurement. These two schools had not been a part of the NSNP or the TBF programme until April 2014 when they started receiving NSNP meals. This factor allowed for comparison between learners that had benefited from the feeding programmes for an extended period and those that had not, and also allowed us to assess changes after the introduction of a nutritional programme in the control schools. Assessment of nutritional impact involved comparing anthropometric data within and across the three groups which had different degrees of access to school meals. Although the introduction of the NSNP in control schools allowed for a pre and post-comparison, it did compromise the control aspect of the experiment since there were no comparable schools not receiving the NSNP over the course of the project. This is a research limitation inherent in the nature of the NSNP which does not exclude any qualifying schools from receiving the programme.

In order to assess the impact of the NSNP and TBF feeding programmes reliably, standard anthropometric measurements were taken from the comparison and control schools. The measurements were conducted at two points in time. In addition, school records of performance and attendance were collected for comparison. A nutritional survey was conducted with 14 year old learners. Finally, qualitative data was collected during interviews and observations at selected schools. The use of various methods allowed for triangulation of the study’s objectives. In addition, the qualitative part of the study also helped to determine whether there were social and school development benefits associated with the feeding programmes and these were used to identify key challenges.

Anthropometric measurements

- A range of anthropometric measurements were taken of learners. These included:
  - Weight
  - Height
  - Body mass index (BMI)
  - Waist circumference
  - Calf skinfold
  - Triceps skinfold

The stature and weight measurements allowed for an analysis of weight for height and weight for age. Measurements were also provided to the WHO Child Growth Standards (WHO, 2007). In addition, we were able to assess body fat percentage using the skinfolds and skinfold skinfold measurements and a maturity age index using the stature and sitting height as well as weight measurements. The body fat percentage and maturity age index provided a more comprehensive analysis of the anthropometric data, particularly as it pertained to obesity.

Phase 1 data collection took place in April 2014 while Phase 2 took place from the end of September to early October 2014. A fieldwork team from the Department of Human Movement Science, University of Fort Hare was deployed for these two waves of data collection. All the fieldworkers were qualified level 1 International Society for the Advancement of Kinanthropometry (ISAK) anthropometrists. All anthropometric measurements were taken according to the International Standards for Anthropometric Measurements (Stewart et al., 2011). The fieldworkers worked in pairs, with one fieldworker taking the measurements while the second recorded the data and double checked the measurement.

The learners were minimal clothing without shoes and were weighed using portable electronic scales. A stadiometer, anthropometric tape measure, and skinfold callipers were used to measure stature and the skinfold respectively. The process of measurement was carried out in a classroom with girls and boys measured separately. Female research participants were measured by a fieldworker of the same gender for dignity purposes.

Nutritional Questionnaire

Previous research has found that an inverse relationship exists between body mass index (BMI) and the consumption of fruits and vegetables. For example, Goss and Grube (2005) reported that respondents who covered their minimum daily intake of fruits and vegetables were more likely to have a higher BMI. However, a large majority of South African households consume a predominantly cereal-based diet with a limited intake of fruits and vegetables. Vitamin A, rich vegetables and fruits are the most neglected so it was important to assess the dietary intake of the learners from poorly resourced communities, where fruit and vegetable intake is bound to be even lower (Faber, Laurie, Van Jaarsveld, 2014). The nutritional questionnaire also allowed us to assess the sugar and “junk food” intake of learners to better understand the ways in which household food patterns influence some of the outcomes.

A nutritional questionnaire (see APPENDIX 1: Research instruments) was administered to 208 sampled learners during Phase 1 of data collection. The most commonly used instruments to estimate fruit and vegetable consumption are the 24-hour dietary recall and the 24-hour dietary recall (Agudo, 2003). In this study, the 24-hour dietary recall was used where Grade 6 and 7s were required to report what they consumed within the 24-hour period prior to the questionnaire being administered. It was considered the most appropriate method to use for primary school children as it requires them to remember short-term recall. The main limitation with this method is that the 24-hour recall does not provide reliable estimates of the usual food intake and it also does not provide daily day-to-day variation (Baranowski & Dorn, 1994). However, it provides preliminary indicative data on the nature of children's diets beyond the school feeding programmes.

Qualitative research

Qualitative research was carried out during Phase 2 of the anthropometric data collection. The aim of the qualitative component was to ascertain what key stakeholders thought and felt about the feeding programmes. The main aim was to address the secondary objectives in relation to social and school benefits, opportunities created and challenges experienced. It also covered the perceptions in relation to the primary objectives of nutrition, school attendance and performance. In-depth interviews were held with school principals, educators and food handlers. A total of 34 interviews were carried out and each interview lasted between 30 minutes to one hour. Interview questions sought to find out about the general school environment, operational issues, food preferences and how the feeding programmes impacted upon the learners and the community from their perspectives as insiders. Key informant interviews were also carried out with NSNP and TBF officials eliciting information regarding their experiences as providers and facilitators of the feeding programmes. Questions asked centered around the purpose, objectives, functionality and impact of the TBF in-school breakfast feeding programme and the NSNP lunch and how they managed the public-private partnership.

Focus group discussions were held with Grade 6 learners and each focus group lasted for approximately 30 minutes to avoid taking up too much class time. Learners were asked about the type of food they received under the feeding programme. If it was enough, if their lives had changed compared to before the implementation of the programme, how it impacted on their nutrition outside of school, and their general wellbeing. A list of interview questions and the focus group guide is found in APPENDIX 1: Research instruments.
3.2 Description of research site

This study took place in the Lady Frere and Qumbu districts in the Eastern Cape Province, which is one of the most rural and poorest provinces of South Africa. Locals here primarily speak isiXhosa as a home language.

The people living in the Lady Frere and Qumbu districts are mostly poor. Village and farm homes are very modest, ranging from small brick homes, to mud huts, to many shacks and dilapidated structures. Educators and principals reported that children were looked after mainly by grandmothers and came from very deprived circumstances. One school reported that none of their learners was cared for by a biological parent, all caregivers were grandmothers and in one case an elderly aunt. Principals were well aware of the difficulties children faced at home, especially in the very small communities. Interestingly, in the smaller communities it was reported that learners seldom actually went hungry, because if there was no food in their own home, it was acceptable practice to go to a neighbour to eat. This practice was not necessarily applicable in the larger villages and towns.

Some of the schools are relatively near to Queenstown, the largest town in the district, or Lady Frere, a small town; thus the amenities, infrastructure and services of an urban centre are not too difficult to access. This includes supermarkets to buy in bulk for the NSNP and banks to manage NSNP finances. However, many of the schools are situated in remote locations accessed only via long drives over very poor roads. Larger villages such as Lithu and Qumbu are poor and have few services and amenities. The schools located in smaller villages also draw learners from the surrounding areas, which means many children travel long distances to school. Some school locations are especially remote and are not near any community at all; children coming to these schools live on farms or isolated settlements and are either served by school transport or walk very long distances to attend.

Schools varied enormously in the cleanliness of the grounds. Some were untidy and littered; others were extremely well cared for despite the poor facilities. School gardens were mostly utilised, although we visited at the beginning of the growing season, so not much vegetation could be seen in the gardens. The photographs on the right shows a school food garden at the start of the growing season.

3.3 Sampling

Selection of schools

In total there are approximately 51,960 government secondary, combined and primary schools in the Eastern Cape, of which 138 are located in lady Frere and a further 243 are in the Qumbu district. Twenty-seven of the Lady Frere schools are recipients of the Tiger Brands breakfast (TBF Annual Report, 2014). While some of these schools are located in the town of Lady Frere, many are sprawled across mountainous countryside with minimal infrastructure. Plumbing, electricity, and well maintained roads are rare in this region of the Eastern Cape.

NSNP and TBF provided a list of all the schools at which their programmes are run in the Lady Frere and Qumbu education districts. The Eastern Cape Department of Basic Education assisted the research team to identify schools that were providing school breakfasts on their own initiatives, from the savings they have made on the NSNP budgets they are given. These schools were excluded from the sample as any effects seen would have confounded the results. Stratified random sampling was used to select schools for the study to ensure that there was adequate representation of schools at the 95% confidence level with a 5% margin of error. This sampling resulted in 20% of schools from each group being selected.

Therefore 31 schools in comparison group 1, eight schools in comparison group 2, and two schools in the control group were selected. Between the two measurement points the number of comparison group 1 schools dropped marginally from 31 to 25 due to a range of reasons, including inaccessibility, lack of access on the part of the school, and school mergers. Details of the reasons for each school that dropped out of the study are provided in APPENDIX 2: Report on schools that dropped out of the study. Two potential control group schools were excluded due to the fact that they were high schools and did not therefore have learners that were of the age of interest for the study.

Selection of learners

Within each school, stratified sampling by grade and gender was used to determine which students would participate in the study. Learners in the control schools were oversampled to account for the reduced number of schools. Learners were also oversampled in Wave 1 to account for possible attrition by Wave 2. The sample for the total number of learners measured per group is shown in Table 2 below. Once data was cleaned the final sample was 1390. This sample provided a 2.57% margin of error at the 95% confidence level. However, there were fewer learners than anticipated in the control group. For the control group there was a 20% margin of error at the 95% confidence level.

Table 2: Number of sampled schools and learners

<table>
<thead>
<tr>
<th>Group</th>
<th>No of schools</th>
<th>Required sample of learners</th>
<th>Sample at first measurement point</th>
<th>Sample at second measurement point</th>
<th>Final sample after cleaning a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Group 1 (NSNP only)</td>
<td>31</td>
<td>505</td>
<td>705</td>
<td>595</td>
<td>570</td>
</tr>
<tr>
<td>Comparison Group 2 (TBF and NSNP)</td>
<td>8</td>
<td>518</td>
<td>575</td>
<td>572</td>
<td>541</td>
</tr>
<tr>
<td>Control Group</td>
<td>2</td>
<td>466</td>
<td>282</td>
<td>278</td>
<td>276</td>
</tr>
<tr>
<td>TOTAL</td>
<td>41</td>
<td>1489</td>
<td>1362</td>
<td>1445</td>
<td>1390</td>
</tr>
</tbody>
</table>

a Some participants were excluded due to inaccuracies in the date of birth data or when sex at wave 1 and wave 2 were inconsistent.
Selection of nutritional questionnaire participants

Prior evidence suggests that younger learners’ recall of nutritional intake is questionable (Livingstone, Robson, Villaace, 2004; Baranowski & Domel 1994). For this reason only the oldest learners in the sample (14 year olds) were asked to complete the nutritional intake questionnaire.

3.4. Data Analysis

Anthropometric data

For this study, anthropometric data was analysed using the WHO Child Growth Standards. Weight-for-age, height-for-age and BMI-for-age were calculated using the WHO Stats macro to develop data against Child Growth Standards. The data was analysed first to understand the percentage of learners in each school type who fell within the normal weight, height and BMI-for-age ranges and to understand whether there were any differences between the schools and whether there was a change over the time period for the control schools, which started receiving the NSNP during the course of the study. For those learners who fell outside the normal ranges, further analysis was conducted to understand the extent of:

- Overweight – More than three standard deviations above the median BMI-for-age
- Underweight – Between two and three standard deviations below the median weight-for-age
- Severely underweight – More than three standard deviations below the median weight-for-age
- Stunting – Between two and three standard deviations below the median height-for-age
- Severe stunting – More than three standard deviations below the median height-for-age
- Obesity – More than two standard deviations above the median BMI-for-age
- Obese – More than two standard deviations above the median BMI-for-age

The use of universal BMI cut-off points is debatable as some researchers argue that lower cut-off points than those recommended should be used for some groups such as the Asain population (Masie-Taylor and Goto, 2007). BMI also does not take into account skeletal structure and the effects of puberty. For this reason body fat percentage was assessed using the calf and triceps skinfold measurements in order to assess whether the BMI-for-age results for obesity could be corroborated with the body fat percentage. Body fat percentages were analysed against body fat percentage charts for boys and girls (Johns, 1987).

Furthermore, a maturity index was developed to analyse whether some of the obesity results could not rather be explained by early maturation and the effects of puberty. The maturity age was calculated by subtracting the age at peak height velocity (PHV) from the chronological age at the time of measurement (Thompson et al., 2002). The PHV equation consisted of chronological age, leg length (stature minus sitting height), and weight and trunk length (sitting height) (Shear et al., 2005). Children with positive PHVs are regarded as early maturers. Their BMI-for-age may be higher than normal but this finding may be explained by their earlier maturation rather than obesity.

The statistical analysis package Stata 13 was used for quantitative analysis purposes. The analysis code developed by the WHO for the purposes of assessing anthropometric data against Child Growth Standards was used (WHO, 2007). The data was analysed for variance in the number of learners falling within the normal category for each indicator between school types as well as over time.

Selection of interview and focus group participants

Purposive sampling was used to select the 10 schools to participate in the qualitative component of the study. Both control schools were selected. Of the comparison schools we aimed to select schools across the region to ensure geographical representation. Once schools were grouped convenience sampling was used. We selected schools that were most likely to be reachable without a 4X4 and where principals agreed to host us for the interviews and focus groups.

Within each school the principal, an educator, and a food handler were interviewed. In addition, one focus group was conducted with Grade 6 learners in each school. The number of learners per focus group ranged from eight to 15 learners.

In addition, key informant interviews were conducted with the following stakeholders:

- The Director of the Tiger Brands Foundation.
- The Director of Feed, Uplift, Educate, Love (FUEL) – an organization working with the Eastern Cape Department of Basic Education to monitor and enhance service delivery of the NSNP.
- Three Eastern Cape Department of Basic Education officials.
- The TBF provincial coordinator for the Eastern Cape.
- The Director of Food, Uplift, Educate, Love (FUEL) – an organization working with the Eastern Cape Department of Basic Education to monitor and enhance service delivery of the NSNP.

Nutritional data

The questionnaire generated data on fruit and vegetable intake. Learners were asked if they had eaten fruits and/ or vegetables the previous day, if so why they had eaten, the time of the day and how much for that day. As Faber et al. (2013) discuss, school children’s preference for unhealthy food and the fact that poverty makes it a challenge to access healthier food which is generally more expensive, the questionnaire also assessed the intake of unhealthy foods such as sweets and chips among the learners. Questions asked also assessed if they had enough to eat and what they had for breakfast, lunch and supper. These questions allowed us to assess dietary diversity and the extent of Vitamin A consumed.

The data was quantified as far as possible according to the Food and Nutrition Technical Assistance (FANTA) project guidelines for dietary diversity and Vitamin A scores for children (Swindale & Bilinsky, 2006) and according to the recommended five portions of fruit and vegetables a day. The following scores were developed to analyse the data:

- A sugar score – A count of the number of times the previous day the learner could have consumed sugar
- A junk food score – A count of the number of times the previous day the learner ate either sweets or chips
- A fruit and vegetable score – A count of the units of fruit and vegetables eaten the previous day
- A dietary diversity score – The dietary diversity score was developed according to the Children’s Dietary Diversity Score (CDDS) (Swindale & Bilinsky, 2006).

All of the scores were assessed by school type, by sex and finally for differences between learners who were overweight/ obese and those who were not.

It should be noted that the sample of children that completed the questionnaire was small and therefore it is not possible to use the results to make claims that are statistically significant. The results are rather used to give an indication of dietary habits that include but go beyond the school nutrition programmes, and to point to possible reasons for some of the differences in anthropometric measurements.

School performance and attendance data

School performance and attendance data was analysed using Stata 13. For the learner performance and attendance data, analysis of variance of the mean performance in each term as well as average days missed between schools and over time was conducted. Any observed differences between school types were assessed for statistical significance.

Qualitative data

The qualitative data was analysed thematically according to a set of codes that was developed by three members of the research team who read through the transcripts and developed themes. The team approach allowed for discussion of interpretation and the corroboration of emerging themes. Transcripts were then coded thematically using Atlas ti®. A process of constant comparison allowed us to identify common and differing themes across the school types.

3.5. Ethical considerations

The study was granted ethical clearance from the University of Johannesburg’s Faculty of Humanities Ethics Committee, implying that the research was assessed for potential ethical risks to participants. Permission for the research was also formally secured from the national Department of Basic Education as well as the Eastern Cape Department of Basic Education with support from the Lady Frere district.

Because the research involved children who were largely from resource poor backgrounds the following particular
3.6. Limitations

A comparative design with random sampling allows for comparison while controlling for additional factors that influence outcomes such as food eaten at home, the distance walked to school, and type of fat distribution. Nevertheless, it is important that such additional factors are considered when interpreting results. This is particularly the case with learner performance and attendance data which is likely to be influenced for more by a range of factors such as school resources and teacher quality than by nutrition. As noted by Hochfeld et al. (2013), access to educational resources and teacher competencies are some of the factors that can be more directly linked to achievement in school. This phenomenon is known as “School Effects” (Raudenbush & Willms, 1993).

It must also be noted that there are limitations in the comparability of the control schools. Because the NSNP feeds children at all Quintile 1 – 3 schools, there is a naturally existing control school that would be of the same socio-economic and geographic status but not receiving the NSNP. The closest possible comparison was the schools that had been re-qualified from Quintile 4 to Quintile 3 schools. Their comparability is questionable for two reasons:

1. They are in a different geographic area to the comparison group schools. Although this area is also rural the effects of geographic location have not been taken into account in the analysis.

2. Because they have been reclassified they are likely to be slightly wealthier schools having originally been classified as Quintile 4 schools. These schools are not likely to be as close a comparison for Quintile 1 schools as they are for Quintile 3 schools. The Tiger Brands Foundation endeavours to target the poorest schools in the areas in which it works.

Furthermore, the Tiger Brands Foundation schools are predominantly Quintile 1 schools while the NSNP schools represent schools that are the three lower quintiles, meaning that comparisons between these two school types are also not ideal. The control group schools had just begun to participate in the NSNP when the first wave of data was collected and it was not possible to obtain a measurement prior to them receiving the NSNP as it would have been unethical to delay the rollout of the programme for the purposes of research. Nevertheless, the programme was unlikely to have had an immediate effect and the change in results presented below should therefore still be reliable.

In this study the pre-and post-measurements were done within a fairly short period. Significant ascensions in indicators like height/age/并与BMI may only be seen in the longer-term. The pretest measurement of the study was due to be collected in February 2014, but due to delays in securing permission and access from departments, it was only possible to collect data in April 2014. The second data collection point, originally scheduled for September – October 2014, could not be changed as this would have interfered with examination time for learners. This meant that the time lapse between waves was very short, possibly too short to be able to see any significant differences over time.

3.7. Reliability and validity

The reliability of the anthropometric measurements was enhanced by ensuring that two people were present to take and check measurements. In addition, standardised, calibrated equipment was used throughout the data collection. As discussed above, those collecting the data were fully trained and qualified to use the equipment as intended. The second data measurement point in the two comparison groups also enhanced the reliability. We would not expect to see much change in the anthropometric outcomes over this period of time for comparison schools since they did not experience any major changes in their nutritional inputs over this short-term control data collection point for the comparison schools therefore serves to enhance the reliability of the measurements.

There are concerns about the learner performance data. In certain instances schools submitted performance data that was unrealistic – either where all learners had incredibly high marks or where all learners had the same or very similar marks. Where these were identified this pattern was reported to principals and they were asked to check and resubmit data. In certain instances data was corrected and resubmitted. In certain instances schools claimed that the data was correct. Where this was the case, despite our concerns, we included the data.

3.8. Capacity building

Anthropometric measurements for this study were taken by a group of third year, honours and master’s students from the Department of Human Movement Science, University of Fort Hare. This research provided these students with the opportunity to be involved in the practical aspects of a research project. They gained hands-on experience with regard to data collection, ensuring that all ethical guidelines were adhered to and also gained much valuable experience in organisational and planning aspects of field research projects.

3.9. Conclusion

The research design used for this study allowed for a situation in which the schools receiving the TSB in-school breakfast feeding programme could be compared to a control situation – schools receiving only the NSNP. In addition, the inclusion of control schools that had only just started receiving the NSNP allowed for a comparison with a control situation for the NSNP only schools. While the control schools were not true controls, they were the closest to control schools that could be identified given the nature of the NSNP. In addition, the research design was strengthened by using random selection of schools and participants. Randomisation ensures that systematic bias in the sample is eliminated (Moos & McCabe, 2000) by ensuring that all schools and participants in the area had an equal chance of participating. For instance, if schools were invited to participate, it is likely that only those with positive experiences would have volunteered to participate. Random sampling protects against such systematic bias in the sample. Randomised studies are considered to be the gold standard of evidence primarily because by eliminating systematic bias, it reduces the plausibility of alternative explanations for observed effects (Ghadish, Cook, & Campbell, 2002).

Furthermore, the design was strengthened by the inclusion of a nutritional questionnaire, which does not control for household effects on nutrition but does allow for a greater understanding of household eating patterns and how they might influence outcomes.

The qualitative component provided an opportunity to extend our understanding of the effects of the programmes beyond the impact to include perceptions of effects and what the programmes meant to key stakeholders. Perhaps the major limitation of the study is the length of time that lapsed between anthropometric data collection points. Ideally a longitudinal study allowing for a longer period and for further follow-ups would strengthen our understanding of the longterm effects of the programmes. This approach should be considered for future research.
4. Results

In this section we report on the three key indicators that were used to determine the impact of the programmes – anthropometry, learner performance, and learner attendance. The results from the nutritional questionnaire, the interviews and the focus groups are used to interpret these findings further. In addition, qualitative data is presented as it pertains to learner and stakeholder perceptions of impact. Thereafter the perceptions of the programmes, including key successes and challenges are presented.

4.1. Anthropometric results

As discussed above, the anthropometric data was analysed by the three key indicators used in the WHO Child Growth Standards – height-for-age, weight-for-age, and BMI-for-age. Weight-for-age data is complemented by the maturity age index and body fat percentage data. Data is compared over time and between the school types. Data was also assessed by sex.

**Height-for-age**

Height-for-age measurements provide information about the rates of stunting in children within a population. Stunting occurs early on in a child’s life and is very resistant to change with the window for opportunity common being accepted to be the first 1000 days of a child’s life. Evidence from both the LadyFiore and the Alexandria studies therefore suggest that the introduction of nutrition programmes may in fact be able to shift stunting levels. It is possible that it is the combined impact of the TBF and NSNP that has some impact on severe stunting levels. However, without conducting a study that accounts for stunting levels prior to and after the introduction of the breakfast programme we cannot state with certainty that the breakfast programme has contributed to the reduced stunting levels in these schools.

Given the debates, it would be worth pursuing this question in further research since the current data does not suggest that nutrition interventions in the school years can shift stunting to some extent.

<table>
<thead>
<tr>
<th>Control</th>
<th>NSNP only</th>
<th>TBF + NSNP</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stunted (%)</td>
<td>Not stunted (%)</td>
<td>n</td>
<td>Stunted (%)</td>
</tr>
<tr>
<td>6.1*</td>
<td>93.5</td>
<td>276</td>
<td>14.5*</td>
</tr>
</tbody>
</table>

* Difference is significant at the p<0.05 level
* Difference is significant at the p<0.005 level

However, when comparing the height-for-age results between schools, there are significant differences as is shown in Table 3 above. Schools receiving only the NSNP are more likely to have children who are stunted as compared to the schools receiving both interventions and the control schools. The Table above shows that 6.5% of control school learners were stunted, whilst around 11% of learners at schools receiving both interventions were stunted. This is as compared to 15.4% of learners in the NSNP only schools. The remainder of learners in these schools fell within the normal height-for-age range or were taller than average. There are two key findings that the Table above raises. The first is that children receiving only the NSNP had stunting rates that are lower than the average stunting rate of 23% for children living in the Eastern Cape aged 0 – 15 years (Shisana et al., 2014). Although we have seen a reduction in stunting levels over the past 20 years in the country, it is still concerning that so many children are stunted particularly given the negative effects of stunting on cognitive development and learning outcomes. The second finding is that learners receiving two meals, despite being from arguably poorer backgrounds, have lower stunting levels than children receiving only one meal.

There is debate as to whether children can “catch-up” on height-for-age in their life course. Prentice et al., (2013a and 2013b) present evidence which suggests that children can catch up between two years and not childhood and again in the puberty years. Research thus suggests that there remains some debate as to the intractability of stunting over the life course of a child. The data presented here seems to suggest that children who are exposed to an additional meal at school have lower stunting rates than those receiving only the NSNP.

**Weight-for-age**

Weight-for-age measures provide information about the rates of children underweight or severely underweight. Children being underweight is an important measure that can indicate malnutrition. A core aim of both the NSNP and the TBF in-school breakfast feeding programmes is to combat under-nourishment and malnutrition. Weight-for-age is therefore a key indicator of progress. Growth standards for weight-for-age are only available for children between the ages of five and 10 years as thereafter puberty skews weight-for-age results.

It is pleasing to note, as indicated in Table 4 below, that across the school types there were very low rates of children who were underweight. The rates were slightly higher at schools receiving the TBF in-school breakfast leading programme, however these differences were not statistically significant.

Table 3: Percentage of learners within normal height-for-age range by school type (both sexes)

Table 4: Percentage of learners within normal weight-for-age range by school type (both sexes)

The weight-for-age analysis was conducted for boys and girls separately but no significant differences in the number of boys and girls who were underweight were shown.

**BMI-for-age**

Perhaps one of the most important anthropometric indicators is BMI-for-age. Given that underweight rates in the sample were relatively low, undernutrition was less of a concern than malnutrition and the potential for obesity outcomes related to eating too much food that was nutritionally deficient. Furthermore, given relatively higher levels of stunting in the schools receiving the NSNP, protecting children against obesity becomes an important consideration.

BMI-for-age provides an indication of both wasting and obesity rates in the sample. Table 5 below indicates that learners within the control schools were significantly more likely to be overweight or obese than those at the schools receiving the nutritional interventions (p=0.005). Across all of the schools overweight and obesity is proportionately associated with stunting. Only six of the overweight learners in the sample were also stunted. This confirms findings by Jinabhai et al. (2003) and Mukindum/Peterson & Krieger (2004) that amongst South African children there is no association between stunting and childhood overweight and obesity.

Learners, they are bright! They have also gained some weight yes weight gain. (Educator from a Control school)
The Tables below also demonstrate that those falling outside of the normal BMI-for-age range were likely to be overweight or obese rather than wasted. As with stunting, wasting levels were marginally higher in schools that received only the NSNP intervention than in either the control schools or schools receiving both interventions. However, these differences were not statistically significant.

### Table 5: Percentage of learners within and outside of normal BMI-for-age range by school type (both sexes)

<table>
<thead>
<tr>
<th>School type</th>
<th>% Not overweight</th>
<th>% Overweight/obese</th>
<th>TOTAL N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>83.1</td>
<td>16.9</td>
<td>569</td>
</tr>
<tr>
<td>NSNP only</td>
<td>88.5</td>
<td>11.5*</td>
<td>540</td>
</tr>
<tr>
<td>TBF+NSNP</td>
<td>85.8</td>
<td>14.2</td>
<td>1109</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Difference is significant at the p=0.005 level

What is significant is that learners at the schools receiving the Tiger Brands breakfast were significantly less likely to be either overweight or obese. In other words, when the percentage of learners who were overweight or obese was combined with the differences tested for statistical significance, it was evident that the breakfast had additional effects in protecting learners from becoming overweight or obese.

### Table 6: Percentage of learners who were overweight by school type (both sexes)

<table>
<thead>
<tr>
<th>School type</th>
<th>% Overweight (&lt;+1SD)</th>
<th>% Obese (&lt;+2SD)</th>
<th>TOTAL N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>0.7</td>
<td>8.6 *</td>
<td>276</td>
</tr>
<tr>
<td>NSNP only</td>
<td>3.9</td>
<td>13.9</td>
<td>569</td>
</tr>
<tr>
<td>TBF+NSNP</td>
<td>1.9</td>
<td>10.2*</td>
<td>540</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2.5</td>
<td>14.9</td>
<td>1383</td>
</tr>
</tbody>
</table>

* Difference significant at the p=0.005 level

### Table 7: BMI-for-age results over time (control schools only)

<table>
<thead>
<tr>
<th>Wave</th>
<th>% Severely wasted (&lt;-3SD)</th>
<th>% Wasted (&lt;+2SD)</th>
<th>% Within normal BMI (&gt;-1SD)</th>
<th>% Overweight (&lt;+1SD)</th>
<th>% Obese (&lt;+2SD)</th>
<th>TOTAL N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>0.7</td>
<td>26.1</td>
<td>8.6</td>
<td>276</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-test</td>
<td>1.8</td>
<td>19.2</td>
<td>7.6</td>
<td>276</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Difference is significant at the p= 0.05 level

These shifts are quite substantial, particularly given the short period of time between the pre and posttest. The reduction in the number of children in the overweight category is not explained by sudden growth spurts. Increases in height across this sample that transitioned out of overweight were minimal (in the range of 1.5cm) over the period.

Unfortunately there is limited evidence in other studies which focuses on weightloss or transitions out of overweight and obesity in children, particularly in the context of nutrition interventions. It is therefore difficult to interpret these results against published studies, which might explain these shifts. One study in the North West province conducted over a three-year period showed that children in Quintile 1 – 3 schools were less likely to become obese over time. In addition, although the numbers of children transitioning out of overweight and obesity were low, children in Quintile 1 – 3 schools were more likely than their Quintile 4 and 5 counterparts to transition out of overweight and obesity (Pienaar, 2013). Although this study was not conducted in the context of the introduction of a nutrition intervention it does point to the potential protective effects of the NSNP. It is possible that in poor contexts, where obesity is likely due to low quality nutrient intake rather than to overconsumption of nutrient dense foods, the introduction of a high nutrient quality meal could produce such substantial changes. However, it is difficult to corroborate this suggestion in the absence of any literature on such changes. This points to an area of further research.

It should also be noted, as indicated above, because the control schools began receiving the intervention during the course of the study, there were no true control schools (i.e. comparable schools not receiving the intervention at all) with which to compare these schools. This factor limits our ability to attribute this change to the introduction of the programme. However, the qualitative research did not reveal any other significant changes at the schools. We may therefore be able to state, with some caution, that the introduction of a nutrition intervention does contribute to ensuring that children fall within the normal BMI-for-age range and that such a programme could therefore be protecting against childhood obesity.

Boys in the control schools were significantly more likely to be overweight or obese than boys at either the NSNP only schools or the schools receiving both interventions. Boys at the schools receiving both interventions were somewhat less likely to be overweight or obese than those at NSNP only schools but these differences were not significant as is shown in Table 8.

### Table 8: Percentage of learners within and outside of normal BMI-for-age range by school type (boys, pre-test)

<table>
<thead>
<tr>
<th>School type</th>
<th>% Severely wasted (&lt;-3SD)</th>
<th>% Wasted (&lt;+2SD)</th>
<th>% Within normal BMI (&gt;-1SD)</th>
<th>% Overweight (&lt;+1SD)</th>
<th>% Obese (&lt;+2SD)</th>
<th>TOTAL N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>0.2</td>
<td>8.6 *</td>
<td>276</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NSNP only</td>
<td>3.7</td>
<td>13.9</td>
<td>569</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TBF+NSNP</td>
<td>1.8</td>
<td>10.2*</td>
<td>540</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>2.3</td>
<td>14.9</td>
<td>1383</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Difference is significant at the p=0.005 level

Again we see the trend of a significant reduction in the number of boys who were overweight between the pretest (23.1%) and posttest (17.2%) in the control schools. This reduction means that by the posttest boys in the control schools were as likely as boys in the interventions schools to be overweight. Boys in the schools receiving both interventions were less likely than boys at the control schools and the NSNP only schools to be obese by the posttest.
Higher BMI-for-age was far more of a challenge amongst girls than boys. As shown in Table 10 and Table 11, it is clear that girls were far more likely to fall outside of the BMI-for-age range than boys. It is striking that in the control schools girls were significantly more likely to be overweight or obese than girls at either the NSNP schools or those receiving both interventions at the first data collection point. Rates of female learners being overweight or obese in the pretest in control schools were exceptionally high (43.3% of female learners). By the posttest there was a reduction in the number of girls who were overweight. This finding is promising and although it cannot be attributed directly to the intervention, barring any other significant changes in the schools, the introduction of the NSNP could have contributed to this shift.

Furthermore, the gap between boys and girls was far more marked in the control schools than in the two comparison schools. This finding may suggest that over time nutrition interventions may have a greater impact on girls who are generally more vulnerable to obesity. However, this assumption can only be confirmed with further follow-up assessments.

In order to assess whether BMI-for-age was a reliable measure to indicate whether children were overweight or obese, a body fat percentage analysis was also conducted. A comparison between the schools shows that children at the control schools on average had a slightly higher body fat percentage than those at either the NSNP only or the NSNP and TBF schools as shown in Table 12 below. This likely confirms the findings above, as the higher average body fat percentage is explained by the higher rates of obesity at control schools.

Table 11: Percentage of girls within and outside of normal BMI-for-age range over time (control schools only)

<table>
<thead>
<tr>
<th>School type</th>
<th>% Severely wasted (&lt;−3SD)</th>
<th>% Wasted (&lt;−2SD)</th>
<th>% Within normal BMI-for-age</th>
<th>% Overweight (&lt;+1SD)</th>
<th>% Obese (&lt;+2SD)</th>
<th>TOTAL N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>0.3</td>
<td>3.4</td>
<td>35.3*</td>
<td>33.1**</td>
<td>10.2**</td>
<td>148</td>
</tr>
<tr>
<td>Post-test</td>
<td>0.4</td>
<td>4.1</td>
<td>74.9*</td>
<td>17.3*</td>
<td>3.3*</td>
<td>271</td>
</tr>
</tbody>
</table>

Table 12: Mean body fat percentage by school type (Pre-test only)

<table>
<thead>
<tr>
<th>School type</th>
<th>Low</th>
<th>Optimal</th>
<th>Mod high - Very high</th>
<th>TOTAL (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>27.54*</td>
<td>57.25</td>
<td>15.21</td>
<td>276</td>
</tr>
<tr>
<td>NSNP only</td>
<td>25.19</td>
<td>51.57</td>
<td>12.24</td>
<td>572</td>
</tr>
<tr>
<td>TBF+NSNP</td>
<td>35.42*</td>
<td>57.75</td>
<td>6.82**</td>
<td>542</td>
</tr>
<tr>
<td>TOTAL</td>
<td>34.17</td>
<td>55.11</td>
<td>10.72</td>
<td>1390</td>
</tr>
</tbody>
</table>

Table 13: Percentage of learners in body fat percentage categories by school type (Pre-test only)

<table>
<thead>
<tr>
<th>School type</th>
<th>Low</th>
<th>Optimal</th>
<th>Mod high</th>
<th>Very high</th>
<th>TOTAL (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>0.3</td>
<td>0.4</td>
<td>0.4</td>
<td>0.3</td>
<td>28.0</td>
</tr>
<tr>
<td>NSNP only</td>
<td>0.3</td>
<td>0.4</td>
<td>0.4</td>
<td>0.3</td>
<td>27.6</td>
</tr>
<tr>
<td>TBF+NSNP</td>
<td>0.3</td>
<td>0.4</td>
<td>0.4</td>
<td>0.3</td>
<td>28.0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>0.3</td>
<td>0.4</td>
<td>0.4</td>
<td>0.3</td>
<td>27.6</td>
</tr>
</tbody>
</table>
When the analysis was conducted only for learners who were overweight or obese on the BMI-for-age measurements the results indicated in Table 17.

<table>
<thead>
<tr>
<th>School type</th>
<th>Gender</th>
<th>Low</th>
<th>Optimal</th>
<th>Mod high</th>
<th>Very high</th>
<th>TOTAL (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Male</td>
<td>25</td>
<td>65.63*</td>
<td>9.38*</td>
<td>128</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>29.73</td>
<td>50.5*</td>
<td>20.27*</td>
<td>148</td>
<td></td>
</tr>
<tr>
<td>NSNP only</td>
<td>Male</td>
<td>41.47**</td>
<td>50.5</td>
<td>8.02*</td>
<td>299</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>30.4*</td>
<td>52.75</td>
<td>16.85*</td>
<td>273</td>
<td></td>
</tr>
<tr>
<td>TBF and NSNP</td>
<td>Male</td>
<td>30.5*</td>
<td>63.48*</td>
<td>6.03</td>
<td>282</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>40.77</td>
<td>51.54*</td>
<td>7.69</td>
<td>260</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>Female</td>
<td>34.13</td>
<td>58.39</td>
<td>7.48</td>
<td>709</td>
<td></td>
</tr>
</tbody>
</table>

The results are significant at the p=0.005 level.

Table 15: Percentage of learners in body fat percentage categories by school type (boys, pre-test only)

<table>
<thead>
<tr>
<th>School type</th>
<th>Low</th>
<th>Optimal</th>
<th>Mod high</th>
<th>Very high</th>
<th>TOTAL (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>25</td>
<td>65.63*</td>
<td>9.38*</td>
<td>128</td>
<td></td>
</tr>
<tr>
<td>NSNP only</td>
<td>41.47**</td>
<td>50.5</td>
<td>8.02*</td>
<td>299</td>
<td></td>
</tr>
<tr>
<td>TBF and NSNP</td>
<td>30.5*</td>
<td>63.48*</td>
<td>6.03</td>
<td>282</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>34.13</td>
<td>58.39</td>
<td>7.48</td>
<td>709</td>
<td></td>
</tr>
</tbody>
</table>

The results are significant at the p=0.005 level.

When considering differences across the school types it is evident that boys at schools receiving only the NSNP were more likely to have a low body fat percentage and less likely than those at the other school types to have an optimal body fat percentage.

Table 16: Percentage of learners in body fat percentage categories by school type (girls, pre-test only)

When the analysis was conducted only for learners who were overweight or obese on the BMI-for-age measurements the results are indicated in Table 17.

This Table demonstrates that while the numbers of learners with moderate to very high body fat percentages was high, there were also a significant number of learners with high BMI-for-age results who had optimal body fat percentage. This finding suggests that maturity might be an explanatory factor in the BMI-for-age results. Across all of the schools the maturity age (as calculated using PMI) was higher than the age at the point of measurement indicating that across all schools there was a large proportion of early maturers. This might account for some of the high levels of obesity and high body fat percentage, especially amongst the girls. However, this applied across all of the schools and therefore does not explain the differences in obesity levels between the school types. This suggests that other home and school factors could explain the differences, including level of physical activity and what foods children were eating.

In order to better understand the differences in the rates of obesity and how to account for the changes, data from the nutritional questionnaire is presented, which reflects all food intake over the previous 24 hours as recalled by the learner, including nutrition programme interventions. It should be noted that there were limitations with the questionnaire, particularly with regard to the small sample of learners who completed the questionnaire (only Grade 6 and 7 learners).

The nutritional questionnaire data demonstrates that there were no major differences in the quality of foods eaten across the school types. Most children are none or one portion of fruit or vegetables the previous day and none ate the recommended five portions of fruit and vegetables a day as shown in Table 18 below.

Table 18: Units of fruit and vegetables eaten the previous day by school type

<table>
<thead>
<tr>
<th>Units of fruit and veg eaten yesterday</th>
<th>Control NSNP only NSNP+TBF TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5 20 37 24.26 17 22.67 59 28.37</td>
</tr>
<tr>
<td>1</td>
<td>11 44 41 37.96 33 44 85 40.87</td>
</tr>
<tr>
<td>2</td>
<td>2 5 20 18.32 21 28 46 22.12</td>
</tr>
<tr>
<td>3</td>
<td>3 12 6 5.56 3 4 1 5 5.77</td>
</tr>
<tr>
<td>4</td>
<td>4 1 4 3.7 1 1 3.3 6 2.88</td>
</tr>
<tr>
<td>TOTAL</td>
<td>25 100 108 100 75 100 208 100</td>
</tr>
</tbody>
</table>

Furthermore, dietary diversity was generally quite poor with none of the children eating the maximum seven different types of food. There were no major differences in dietary diversity between the school types.

Table 20: Dietary diversity score by school type

<table>
<thead>
<tr>
<th>Dietary diversity count</th>
<th>Control NSNP only NSNP+TBF TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>1 4 1 0.93 0.00 0.96 1 0.96</td>
</tr>
<tr>
<td>1.0</td>
<td>2 8 11 10.19 6 8.00 19 9.13</td>
</tr>
<tr>
<td>2.0</td>
<td>2 12 30 27.78 23 30.67 56 26.92</td>
</tr>
<tr>
<td>3.0</td>
<td>3 8 32 42 38.89 17 22.67 67 32.21</td>
</tr>
<tr>
<td>4.0</td>
<td>4 10 19 17.39 17 22.67 46 22.12</td>
</tr>
<tr>
<td>5.0</td>
<td>1 4 5 4.63 12 16 18 8.65</td>
</tr>
<tr>
<td>TOTAL</td>
<td>25 100 108 100 75 100 208 100</td>
</tr>
</tbody>
</table>

The nutrition analysis also demonstrates that children were eating a fair amount of sugar. Although the nutritional questionnaire did not allow us to assess total sugar intake as a percentage of total diet, it did allow us to assess the number of times that children had consumed sugar the previous day. Almost 75% of learners indicated having eaten sugar at least twice in the previous day, and 79% indicated having eaten junk food such as chips at least once the previous day. While...
Children at control schools were somewhat more likely than children at other schools to have eaten junk food the previous day. However, the small number of participants from control schools means that this finding should be treated with caution.

A key intervention that both the NSNP and the TBF in-school breakfast feeding programme delivers in addition to meals is lessons on healthy eating habits. Interestingly, children at NSNP schools and those at schools receiving both interventions were less likely to have eaten sugar or junk food the previous day, and if they indicated that they had had sugar or junk food they were more likely to have consumed less than their control group counterparts. The study did not assess whether the healthy eating lessons delivered by NSNP and TBF were shaping these outcomes.

**Conclusion**

What is clear from the above analysis is that levels of wasting were low across the study population. Stunting levels at schools receiving the TBF in-school breakfast feeding programme were lower than for those receiving only the NSNP, despite TBF targeting the most vulnerable schools in the area. It is not clear why this was the case since stunting is very resistant to change. However, the introduction of a breakfast programme in the Alexandra area also showed a reduction in stunting (Mackfield et al., 2013). It will be important to track progress on stunting over time as this phenomenon is likely to only change over a long period of time.

The data shows that control schools had higher rates of obesity than those receiving the interventions and that after the introduction of the NSNP in control schools obesity levels reduced. This is a positive but surprising finding, particularly given the relatively short time period between the pre- and posttests. There is minimal literature focusing on transitions out of overweight and obesity in developing contexts and particularly in the context of school-based nutritional interventions and it is therefore difficult to assess the reasons for this decline. While we cannot attribute this change to the NSNP without data from true control schools, barring any other major developments at such schools, it is likely that the introduction of the programme had some influence on these changes. This may point to the potentially protective effects of the NSNP. It is also promising to note that obesity levels for girls in the schools receiving both interventions were far lower than for girls in either of the other two types of schools. This finding suggests that breakfast may be protecting girls from being overweight or obese. This finding was corroborated with the body fat percentage data.

**4.2. Learner performance results**

A central goal of both nutritional programmes is to impact positively on learners’ educational performance. Previous research has shown that nutritional inputs improve their short-term (such as improved concentration in class) as well as their long-term educational performance, of malnourished children (Hapier et al., 2009; Levitsky, 2003). In this study we compared school performance, in the form of Term marks or grades, of learners in Term 1, 2014, with the same learners’ performance in Term 4, 2014. These results were then compared across groups 1, 2 and 3. In addition, performance from Term 1 to Term 4 in 2013 was assessed for control group schools in order to gauge what performance improvements could be expected in a situation where no intervention existed.

Data was provided using the Curriculum Assessment Policy Statement (CAPS) system. According to this system marks are given to learners as follows:

<table>
<thead>
<tr>
<th>RATING CODE</th>
<th>ACHIEVEMENT DESCRIPTION</th>
<th>MARKS %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Not Achieved</td>
<td>0 – 29</td>
</tr>
<tr>
<td>2</td>
<td>Elementary Achievement</td>
<td>30 – 39</td>
</tr>
<tr>
<td>3</td>
<td>Moderate Achievement</td>
<td>40 – 49</td>
</tr>
<tr>
<td>4</td>
<td>Substantial Achievement</td>
<td>50 – 69</td>
</tr>
<tr>
<td>5</td>
<td>Adequate Achievement</td>
<td>70 – 79</td>
</tr>
<tr>
<td>6</td>
<td>Meritorious Achievement</td>
<td>80 – 99</td>
</tr>
<tr>
<td>7</td>
<td>Outstanding Achievement</td>
<td>100</td>
</tr>
</tbody>
</table>

Because the variance of these values (1 to 7) is so small, a change that appears very small – for example, from a first Term average of 2.00 to a fourth Term average of 2.50 – in reality is a substantial change in performance over a year.

The data presented in Table 21 below demonstrates that before the introduction of the NSNP at control schools, learners in such schools had lower Term 1 averages than those at both NSNP only schools and schools receiving both interventions. The difference between control schools and the schools receiving the breakfast was statistically significant. The control group began receiving NSNP meals April 2014, directly after the Term 1 assessments were released.

**Table 20: CAPS Assessment system codes**

| Average school performance from Term 1 to Term 4 in 2014 by school type |
|-----------------------------|-----------------------------|-----------------------------|
| RATING CODE | ACHIEVEMENT DESCRIPTION | MARKS % |  
| Control schools (2013) | 3.27 | 4.08 |
| Control schools (2014) | 3.39 | 4.04 |
| NSNP only schools | 3.58 | 4.21 |
| NSNP and TBF schools | 3.65 | 4.28 |

* Difference significant at the p=0.05 level

These results are also demonstrated in Figure 4. It is clear that both comparison groups showed enhanced performance over the course of the year and followed much the same trajectory, although those receiving the breakfast started out and ended up with slightly better results than those at NSNP only and control schools. Learners at the control schools achieved lower marks across the period. However, these marks were similar to what was seen in 2013 when these schools did not receive any intervention.

---

Table 19: Number of times junk food was eaten by school type

<table>
<thead>
<tr>
<th>No of times junk food was eaten yesterday</th>
<th>Control</th>
<th>NSNP only</th>
<th>NSNP+TBF</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>----------</td>
<td>-----</td>
<td>----------</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>0</td>
<td>29</td>
<td>26.85</td>
<td>14</td>
<td>45</td>
</tr>
<tr>
<td>1</td>
<td>36</td>
<td>33.33</td>
<td>36</td>
<td>48</td>
</tr>
<tr>
<td>2</td>
<td>64</td>
<td>40.38</td>
<td>25</td>
<td>33.33</td>
</tr>
</tbody>
</table>

Therefore comparing the control group to the other groups in Term 1 represented a genuine comparison of learners receiving no nutritional input at school at all, with those getting school meals, and a significant difference was found. This shows that those receiving two meals were doing better than those receiving none or one meal.

Overall, learners in all school groups improved their performance from Term 1 to Term 4. However, the differences in performance when the Term 4 data from the three groups was compared was not significant. This result is reflected in Table 21 below.
It should be noted that learner performance is shaped by many variables, some of which are far more directly related to performance than nutrition is. These include teacher performance and access to learning materials. By considering the 2013 results in comparison to the 2014 results it is clear that the changes we did see in the learner performance results were attributable to a range of factors aside from the nutrition interventions.

However, principals, learners and educators felt strongly that the nutrition programmes improved learner performance. Interviews with principals and educators indicated that the impact of school feeding on the education of learners extended beyond school performance results at assessment time.

Learners who received the NSNP lunch reported that they felt much better after eating a meal at school, indicating that they had more energy. This theme was reflected in the qualitative quotes:

I: Do you like the food at school?
R: Yes, because it gives me energy. (Learner Focus Group at a NSNP school)

They felt highly positive about receiving the NSNP lunch, particularly as it helped them participate more effectively.

R: Because sometimes we don’t get food and get hungry we were not able to participate in class so that is why we like it. (Learner Focus Group at a Control school)

A number of educators noticed that learners had more energy to engage in activities like play during break time after eating the NSNP meal. Various educators pointed out that since receiving the TBF breakfast learners were more energised and refreshed during morning lessons, which are key components to successful curriculum delivery.

When the control schools’ 2014 results are compared to the same learners’ 2013 results (i.e. when the schools were receiving no interventions) it is clear that there was also a marked increase over the course of one year. In fact, the rate of change in 2013 was faster than for 2014 as shown in Figure 4 above. This demonstrates that the rate of change over time was what could be expected over the course of an academic year regardless of any intervention. Nevertheless, the differences between the school types seem to suggest that those receiving some kind of intervention were doing better than those receiving none and that those receiving the breakfast programme were doing better than those that were not. However, the differences between learners in NSNP-only schools and those receiving both breakfast and lunch was not statistically significant.

School performance is affected by many variables, including quality teaching, the availability of learning support materials, the functionality of the infrastructure, and many other variables in the school and home environment. In addition, improvements in performance due to improved nutrition, is a relatively slow process. Better concentration and participation in class, on the other hand, are usually gains that can be observed in the short-term and have a direct link to nutritional health. As these are difficult to measure quantitatively, we gathered data on this aspect in the qualitative interviews. Similar to the results from the previous TBF evaluation study (Rothfeld et al., 2013), many educators and principals noticed an improvement in learner concentration and participation.

This observation was true of NSNP-only schools, indicating that they were positively fulfilling a key objective of the programme which is “to contribute to enhancing learning capacity through school feeding” (Randall-Mikos, Wierzbicki & Sibanda, 2013: 4). Some comments from our interviews capture this view:

Comments such as the following were common:

“Now they [are] always fresh.” (Principal from a TBF school)

They seem happier, they are always happy and they are physically fit, so you will see the fitness of the child when they are playing outside. (Educator from a Control school)

In schools receiving both TBF and NSNP meals, learners often remarked that they no longer felt hungry in the mornings:

We don’t get hungry like before. We don’t sleep in class when we’ve eaten. We like breakfast. It makes me excited. (Learner Focus Group at a TBF school)

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In schools receiving both TBF and NSNP meals, learners often remarked that they no longer felt hungry in the mornings:

We don’t get hungry like before. We don’t sleep in class when we’ve eaten. We like breakfast. It makes me excited. (Learner Focus Group at a TBF school)

School performance is affected by many variables, including quality teaching, the availability of learning support materials, the functionality of the infrastructure, and many other variables in the school and home environment. In addition, improvements in performance due to improved nutrition, is a relatively slow process. Better concentration and participation in class, on the other hand, are usually gains that can be observed in the short-term and have a direct link to nutritional health. As these are difficult to measure quantitatively, we gathered data on this aspect in the qualitative interviews. Similar to the results from the previous TBF evaluation study (Rothfeld et al., 2013), many educators and principals noticed an improvement in learner concentration and participation.

This observation was true of NSNP-only schools, indicating that they were positively fulfilling a key objective of the programme which is “to contribute to enhancing learning capacity through school feeding” (Randall-Mikos, Wierzbicki & Sibanda, 2013: 4). Some comments from our interviews capture this view:
Interestingly, the school officials also attributed a positive change in the learners’ attendance to the addition of breakfast to the school food offering. Several educators noted:

There is a change at least they are playing (not fighting). They play right. (Educator from a TBF school)

They interact very well. There is no fighting; they used to fight a lot. (Educator from a TBF school)

4.3. School attendance results

In general, low absenteeism rates were recorded in 2014 in schools across all groups, with slightly higher average absenteeism in Term 1 than in Term 4. The differences between the school groups were minor and were not statistically significant.

Table 22: Average days absent in Term 1 and Term 4 (2014) by school type

<table>
<thead>
<tr>
<th>School type</th>
<th>Term 1</th>
<th>Term 2</th>
<th>Term 3</th>
<th>Term 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control schools (2013)</td>
<td>1.1</td>
<td>1.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control schools (2014)</td>
<td>1</td>
<td>0.96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NSNP only schools</td>
<td>1.13</td>
<td>0.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NSNP and TBF schools</td>
<td>1.2</td>
<td>0.87</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When looking at the absenteeism data in terms of the percentage of learners who were absent for a number of days it is clear that in the control schools there are no major changes between Term 1 and Term 4. In the NSNP only schools and those receiving the Tiger Brands breakfast absenteeism decreases overtime: by Term 4 more children are not absent at all and fewer children were absent for two or three days in the Term.

Table 24: Percentage of learners absent by number of days absent and school type

<table>
<thead>
<tr>
<th>School type</th>
<th>Term</th>
<th>0 days</th>
<th>1 day</th>
<th>2 days</th>
<th>3 days</th>
<th>&gt; 3 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>T1</td>
<td>53%</td>
<td>12%</td>
<td>17%</td>
<td>11%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>T4</td>
<td>56%</td>
<td>13%</td>
<td>16%</td>
<td>8%</td>
<td>6%</td>
</tr>
<tr>
<td>NSNP only</td>
<td>T1</td>
<td>50%</td>
<td>16%</td>
<td>11%</td>
<td>8%</td>
<td>14%</td>
</tr>
<tr>
<td></td>
<td>T4</td>
<td>58%</td>
<td>14%</td>
<td>9%</td>
<td>5%</td>
<td>14%</td>
</tr>
<tr>
<td>NSNP + TBF</td>
<td>T1</td>
<td>54%</td>
<td>16%</td>
<td>13%</td>
<td>8%</td>
<td>9%</td>
</tr>
<tr>
<td></td>
<td>T4</td>
<td>67%</td>
<td>15%</td>
<td>9%</td>
<td>3%</td>
<td>6%</td>
</tr>
</tbody>
</table>

While many schools felt that they did not struggle with absenteeism, it was widely acknowledged by principals and educators alike, that receiving a meal at school was a strong incentive for children to attend school. These comments were from educators at NSNP only schools:

Interviewees felt that households that were vulnerable or headed by a grandparent were incentivised to encourage their children or grandchildren to attend school. These comments were from educators at NSNP only schools:

They are mostly encouraged by the food. The food that they get makes it easy for them to get few [absences]. (Principal from a control school)

The numbers of children coming to school regularly have increased since the introduction of the food programme. (Principal from a NSNP school)

One of the educators from a control school that had only recently started receiving lunch from the NSNP specifically commented on an improvement in learner attendance since receiving the programme:

They are more interested in eating healthy food. It gets the children to attend school. (Educator from a control school)

4.4. Other benefits, monitoring, and functionality

While the NSNP and the TBF’s primary objective is to provide nourishment to learners in Quintile 1-3 schools, there are other benefits that schools experience as a result of these programmes. These are referred to as secondary benefits and are discussed in the first part of this section. The process of monitoring the nutrition programmes as well as their functionality is then addressed.

School benefits

Principals and educators felt generally positive about the NSNP nutrition programme, and felt that it was a key motivator for children to attend school. Comments were made that the food was the primary incentive for school attendance, to the extent that even sick children would arrive at school in order to eat, and they would go home after that meal. One educator commented:

Since there is this nutrition programme running at schools they only come to school for food. (Principal from a NSNP school)

In addition, the TBF programme enjoys the support of many of the educators because enough food is delivered to include the teachers in the breakfast programme. Moreover, it is easy to administer the dish-up of porridge - and therefore requires minimal effort from the teaching staff. As breakfast is served before 08:00 it also encourages educators to arrive on time every morning, which benefits the school as a whole. Educators commented as follows:

We do really enjoy this programme. (Educator from a TBF school)

The TBF programme has an additional benefit, too: six schools have been equipped with kitchens in the Lady Frere area. The benefits of having a fully equipped and functioning kitchen cannot be overstated. A fully equipped kitchen allows food handlers to cook food properly and hygienically. Food handlers in schools with poor or no kitchen facilities regularly commented on how the environment had a negative impact on food quality, as wind blew dust into the food cooked outside or in inadequate shelters, or wet or windy conditions put out cooking fires so food was not cooked properly.

In addition, the TBF mobile kitchen also provides some extra storage space. One principal said:

Because at least there is some kitchen, neh? So we can store [food] well with that kitchen, it’s huge. (Educator from a TBF school)

A specific benefit of the NSNP is the sustainable food production initiatives in schools that they promote as a secondary objective of the programme. Many school
Social and community benefits

According to the national census conducted by StatsSA in 2011, the unemployment rate in the Lady Frere area was at 46.3%, which is nearly double the national average. Therefore initiatives which create employment in this area are of the utmost importance. The NSNP allocates a monthly stipend to food handlers, which provides a source of much needed income to community members. Depending on the size of the school, between one and four community members, parents of children at the school, can be employed at a school as food handlers for the year. This is a rotational position which means other members of the community can benefit from this initiative, food handlers are changed annually. Key stakeholders such as principals, educators and caregivers are part of the process of selecting which parent is given the position, and the decision is often made on the basis of the household’s neediness. One food handler expressed her gratitude for the work as follows:

They know that their children are eating at school and they are so impressed by that (Principal from a Control school)

Yes there are learners who are benefiting. Especially those learners who are staying with their grandparents. Because sometimes they are not able to give enough care to them. When they were carrying those lunch boxes their meals were so little. But now you can see that they are happy because of this nutrition programme. (Educator from a Control school)

School holidays can be quite daunting for many families who have come to depend on the school meals, and are especially difficult where children are also getting a daily breakfast from TBF during Term time. One principal voiced this situation as follows:

They love it very much and as a result they don’t like when the school is being closed (Principal from a TBF school)

A popular element of the TBF programme is that it allows schools to send surplus food home on weekends or at the end of Term. This practice has the added bonus of stimulating local production has been a positive gain offset by the nutrition education in schools. Through this objective, learners are encouraged to make better decisions about their food choices by improving their nutrition literacy. Better nutrition literacy is not only about communicating information but also about giving learners the agency to take action when deciding what to eat. In addition, secondary skills like good eating etiquettes have been attributed to the NSNP and especially the TBF programme. An educator and an official commented:

Improved nutrition literacy

A key objective of the NSNP and TBF is to strengthen nutrition education in schools. Through this objective, learners are encouraged to make better decisions about their food choices by improving their nutrition literacy. Better nutrition literacy is not only about communicating information but also about giving learners the agency to take action when deciding what to eat. In addition, secondary skills like good eating etiquettes have been attributed to the NSNP and especially the TBF programme. An educator and an official commented:

The learners … since we are teaching them life skills so we give them the examples of healthy eating habits. (Educator from a Control school)

They teach them about table manners. Even at lunch time they know exactly what to do (Babulova Gical, TBF Eastern Cape Coordinator)

All learners interviewed knew the basics of healthy eating. They were able to list healthy food groups such as vegetables and unhealthy food groups such as fats and sugars. Although this does not mean that all learners at the schools had good nutrition knowledge or that their knowledge was attributable to the programmes, it is pleasing to note that those in the focus groups were confident in their knowledge of good nutrition. These examples are excepts from focus groups held with Grade six learners:

Interviewer: Why are sweets bad for you? Learner 1: Sweets
Interviewer: Tell me why food is unhealthy? Learner 1: Pizza, and fast food. Because it only makes calories, it has too much oil. It is just junk food and they build up and they even make you vomit. (Focus Group at a TBF school)

At the schools that are part of the TBF programme in Lady Frere, food handlers have been given the opportunity to earn some extra money over and above the stipend they receive from the DBE. TBF funds this additional stipend (of R120 monthly) to cover the work involved in cooking breakfast daily. TBF pays the money to the school which disperses it to the individuals. In some communities, locally grown vegetables were being sourced by schools for their lunches. Stimulating local production has been a positive gain offset by the nutrition programme, and it offers livelihoods to small scale farmers. Poverty in the area means that caregivers are appreciative of the daily lunch that the NSNP provides to their children. Food insecurity in the broader District Municipality is the second highest in the Eastern Cape at 83% (StatsSA, 2011). Therefore, having at least one nutritious meal a day provided to these vulnerable households goes a long way to reducing this unacceptable high rate of food insecurity. Educators commented as follows:

They know that their children are eating at school and they are so impressed by that (Principal from a Control school)

As TBF introduced this, we did call parents and said this company is having this product and because of your support is doing a great work. So we have to continue to support it (Principal from a NSNP school)

When visiting the school in those days, you would see the parents singing,ulating “there is TBF, the Good Samaritan”. Those are some of the things, and even if you would go to the meeting at school, they would be emphasising, “we wish you would stay here for a long time because here we are used to the supper only and at school they are giving breakfast, they are giving lunch, then if they can be given supper”. Then they are so positive about the programme. (Babulova Gical, TBF Eastern Cape Coordinator)

Programme monitoring

From the schools’ point of view, the major distinction between the two programmes in relation to managing the meals is that on the one hand they are responsible for procurement for the NSNP, meaning they have to budget, manage money, source, buy, transport and store food themselves. On the other hand, TBF manages all ordering, procurement and delivery themselves, and the schools merely need to store the food prior to preparing it for consumption. The oversight and monitoring processes are therefore substantially different.

Four provinces in South Africa are using the decentralised procurement model of the NSNP, the Eastern Cape is one of them. Procurement of services is directly handled by schools from the funds that are transferred to them by the provincial office. Based on the 1996 Schools’ Act, for schools to be able to handle their own procurement, they are required to have a “Section 21” status which “indicates that they have enough skills and expertise to handle the school finances and procurement” (Rendall-Mkosi, Wenhold & Sibanda, 2013: 20).

As a result the Department of Education Eastern Cape has in place various reporting strategies. These are essential in ensuring that money allocated to the school for lunch is
Although clearly the system is improving, gathering the kind of information required monthly can be problematic, especially as there is only one monitor permanently employed who relies on contract workers to meet monthly targets.

In contrast, TBF has a clearly defined reporting structure that is easy to use and requires very little administrative input from schools, largely because the schools have for less responsibility in ensuring the breakfast is served versus the NSNP lunch. This approach enables an already overworked teaching complement the freedom to focus on curriculum delivery. Thanks to Mobenzi technology (a data capturing and reporting hardware and software package), TBF schools are in constant contact with their Tiger Brands assigned Field Monitor. Schools are able to communicate regularly with TBF, which means any breakfast related problem can be dealt with immediately. The Mobenzi headsets provides schools with a direct line to Tiger Brands, reinforcing the supportive role that Tiger Brands plays in the lives of the principals, educators, food handlers and learners. The TBF project coordinator explained the process.

I am the project coordinator and I visit the schools every day. I have 27 schools and I can’t do 27 schools in one day. I do two or three schools but for breakfast we are using... we have got a phone, a headset that is called Mobenzi for reporting, each and every school has that Mobenzi headset and I have that headset which is called Mobenzi headstart. It has built-in the template that is asking everything that is happening in the school, like if whether they have water, gas and the challenges that they are facing and they are taking photo of the breakfast. So that is our monitoring tool, even if I do not reach each and every school, the report is always going to the office(Balakavu Gical, TBF Eastern Cape Coordinator).

Overall, therefore, the TBF monitoring works smoothly, while there are challenges with the NSNP monitoring and reporting process. This is, however, to be expected as the scale and complexity of the programmes are very different. No specific suggestions were made to improve the NSNP monitoring.

Functionality
In order to ensure the long-term success of the food programmes, it is important to evaluate the functionality of the scheme. We first look at what stakeholders believed would work well.

Overall there was enthusiastic support for both feeding programmes in all the schools visited. While there were some concerns raised specifically about the NSNP (dealt with later in this section), the general consensus was that the DBE programme was working well, achieving its aim of improved nutrition to deprived children, and was well-received by the learners and the community. It was seen as an important poverty alleviation strategy for a remote and needy area of the country. Secondary benefits were raised, such as the school and community benefits outlined above. Two specific areas that have not yet been mentioned are discussed below: the compatibility of the NSNP and TBF programmes, and the benefits of partnerships with other government departments.

Many stakeholders felt that schools that received both the NSNP and TBF nutrition programmes were better equipped to provide better learning environments for their learners, particularly in light of the fact that schools that receive TBF breakfasts lead children an early lunch at 10.00 which needs to sustain them through breakfast and lunch. This issue was reflected in the comments below.

And then on the other hand our programme on the other hand the schools sometimes are not punctual at feeding the learners at ten o clock you see. You see on a windy day it takes a long time to cook. But they are lying most of them. But they cannot have a full stomach for the whole day as compared to the schools that have two meals. Ja so in Tiger Brands together with School Nutrition they are serving a purpose of one which is poverty alleviation for school children. (Lady Freire District Official)

Both meals are important for them because when they go to the primary school it was too late (Principal from a TBF school).

Yes it’s too late, like if the kids could start having breakfast then lunch it would be better (Food Handler from a Control school).

In some cases the Department of Health also plays a role in supplying water tanks to schools that have a shortage of water. Department of Agriculture, Forestry and Fisheries has been a primary partner. This has also been important to help with gardening to help the learners get more vegetables. This partnership assists not only the school itself, but also community members who are encouraged to grow and sell vegetables. It was felt that the spin-off benefits of growing and selling vegetables to the community and to schools to serve the NSNP programme was an important achievement of the programme. Officials recognised this benefit, as in the first quote above, and this view was reinforced by a comment from a community member who is also a food handler at the school.

Support via the monitoring process is an effective way to assist schools in running their nutrition programmes efficiently. So it was felt that the programme could be redesigned to assist our monitoring strategy. They have come up with a concept called MRR, monitor, respond and report. So it has shifted the whole view of monitoring as how it makes sure that schools understand what is expected of them. Understand what amount they must spend per meal per day, per learner per month. So all is designed according to the specifics of the school, and it is helping us a lot for this new aspect of monitoring (Lady Freere District Official).

We are having a good partnership with the Department of Agriculture. So to such an extent that they were having a programme that they were giving out gardening tools to the schools so that they must improve their gardens. They call it the “Four Ace Programme”. Forty eight schools have received two hoses, three spades and three forks together with a hosepipe and seedlings (Lady Freere District Official).

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NSNP monitoring, is however, a challenge, due to the scale of the programme and the inaccessible location of so many of the schools in this district. The monitoring concerns were largely related to these logistical issues. The NSNP monitor for the Lady Freere district aims to visit at least 10% of the district schools per month. A good summary of these issues is captured by an official who said:

Yes the programme has also got an element of monitoring which currently is a challenge. It’s a challenge in that there are about 53,332 schools in 2014 and there are 23 districts. And in each district there is only one dedicated person that is permanently employed for the programme. For example if I take Umlazi which is a mega district with 400 and something schools and with only one dedicated person for nutrition. Yes there is admin staff and what we have done is that we have appointed two monitors on contract for districts like as Isibila, Kings Williams Town and Port Elizabeth. So we are requiring those appointed people to at least cover a minimum of 10% that is about 40 to 30 schools per month. (Lady Freere District Official)

In the first three days of the month. And as the month is going we get them and we reach 100% (Lady Freere District Official).
While there were problems reported in the running of the NSNP, it was heartening to note that these were often school specific or had already been brought to the attention of the DBE. There were some problems that were a consistent theme across the majority of schools, and in most cases the DBE was not only aware of the problem but already attending to it. These issues are highlighted below.

One key concern was facilities and infrastructure. Almost all schools expressed a desire for an equipped kitchen to be provided. This facility helps food handlers prepare food timeously, to capacity and ensures that the food is cooked properly. Meals such as samp take a long time to cook and this time factor is compounded when schools run out of gas. In instances like this most food handlers resort to using wood burning fires outside which can be problematic, especially when it rains or is windy. With longer cooking times many food handlers end up leaving work later than required. Some can sometimes arrive at work as early as 05:00 and only leave after 14:00. Some also mentioned needing storage space in order to store dry goods for each month. While these concerns were expressed in relation to the feeding programmes as indicated in the quote below, poor general infrastructure was a concern in schools nationwide.

I mean there is no real facility for cooking, no real facility for storing food, no real facility as a kitchen where you would have the gas cylinders outside. As it is now it’s dangerous. If anything happens there the Aunties will … in fact they are risking their lives, because the gas cylinder is inside where they are cooking, which is not supposed to be, because that corner was never meant to be a kitchen. (Principal from a Control school)

A functioning and fully equipped kitchen ensures that food is cooked properly. Some learners commented that they would eat the school lunch more often if it was cooked properly.

Sometimes the food is not properly cooked (Learner Focus Group at a TBF school).

I don’t like the food here at school and I don’t eat it, I eat my lunch box because they don’t cook it nice mam. (Learner Focus Group at a Control school)

Yes, the problem is money (Food Handler from a Control school)

The job is too big. We struggle with water and with winter because we travel a distance (Food Handler from a Control school).

With the need for so much reporting, various principals and educators felt that the NSNP cuts into valuable teaching time. Teachers had to take time away from teaching to complete forms for the DBE as well as take time to dish up food every day for the learners. This was compounded by the fact that most schools in the area were understaffed to begin with.

Increased enrolment brings concurrent pressure on school infrastructure, facilities and teaching staff. Whether these perceptions are borne out by enrolment data is something that needs to be assessed in future monitoring.

Principals and teachers who were interviewed perceived that an unintended consequence specific to the TBF programme was that it has increased enrolment in schools which received breakfast. They claimed that parents were now choosing to enrol their children in schools which received breakfast as opposed to neighbouring schools that did not.

Food handlers complained that they were not being paid enough. While this position only pays a stipend, many food handlers end up spending more than just a half day at the school.

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Even this nutrition we have to do it ourselves. Even go as far as to buy the food for the learners, and we are running short of teachers. If two people are doing this here, there are no teachers in the classrooms (Principal from a NSNP school).

To count the kids, how many kids are eating? I am supposed to check every day. And also to give the food handler the register to sign. But truly speaking I did not manage (Educator from a TBF school).

Increased enrolment brings concurrent pressure on school infrastructure, facilities and teaching staff. Whether these perceptions are borne out by enrolment data is something that needs to be assessed in future monitoring.

Other schools that are around they are not having this programme of breakfast. And they didn’t have this programme of the breakfast in their schools. They didn’t get the food parcels in their schools and some of the parents decided to take their children here at my school. Like there is a village up there, their learners and there is this school, they usually take their learners there. Last year, there were two learners from that school and this year is five so the programme boosted our enrollment (Principal from a NSNP school).

Increased enrolment brings concurrent pressure on school infrastructure, facilities and teaching staff. Whether these perceptions are borne out by enrolment data is something that needs to be assessed in future monitoring.
5. Conclusion and recommendations

This study assessed the impact of two school nutrition programmes in South Africa: the government’s National School Nutrition Programme (NSNP) and the Tiger Brands Foundation in-school breakfast feeding programme (TBF). The NSNP delivers a cooked meal to all Quintile 1 – 3 schools nationally (reaching approximately 8.8 million children daily), while the TBF programme delivers breakfast in the form of fortified cooked porridge to over 40,000 children nationally, primarily in Quintile 1 and 2 schools. This study assessed schools located in the Lady Frere district of the Eastern Cape. Although the TBF programme has previously been evaluated for impact in an urban setting, this is the first study which has evaluated the impact of the NSNP programme.

The study, using a comparative research design with the addition of a naturally occurring pre and posttest in control schools, reveals that in the sampled schools both programmes have positive effects on anthropometric outcomes. In addition, learners in schools receiving the interventions have higher school marks than those not receiving the intervention, although this result cannot be directly attributed to the nutrition programmes.

### Nutrition

Specifically, the results demonstrate that across all of the schools the numbers of children who were underweight or wasted was low, in fact, lower than the national average of 6%. This finding seems to suggest that the nutritional interventions at the schools studied have an important effect on reducing levels of children being underweight or wasted. Children at the schools receiving breakfast (which are children at the poorest schools) were as likely as children from the relatively wealthier schools (control schools) to be underweight rather than more likely. This suggests that the lunch and breakfast combined provides nutrients to protect the most vulnerable children from undernutrition. In addition, school stakeholders perceived a significant change amongst the learners that were noticeably underweight prior to receiving the in-school breakfast, reporting positive weight changes for these individuals.

For the control schools and schools receiving the breakfast, stunting levels were lower than the national average for 4 – 14 year olds of 13% and much lower than the national average of 23% for children 0 – 15 years in the Eastern Cape (Shisana et al., 2014). Interestingly though, children at schools receiving the NSNP had significantly higher rates of stunting than children at the other school types, although these rates were still much lower than the rates for children in the Eastern Cape. Conversely, children at the relatively poorer TBF schools were less likely to be stunted than those at the NSNP only schools. Literature demonstrates that stunting is very resistant to change, particularly as children age. Ideally, undernutrition effects need to be dealt with in early childhood to avoid stunting. However, recent literature raises debates about the resistance of stunting (Prentice et al. 2011b) that suggest that children can catch up from stunting later on in life. The data presented here may mean that the additional nutrition of the breakfast was shifting stunting levels. The same effect was seen in the schools that participated in the previous Tiger Brands Foundation study in Alexandra. Stunting levels were reduced by almost five percentage points over a ten month period (Hochfeld et al., 2013). This points to the need for further research to confirm whether or not the combined nutrition interventions, and particularly the effect of a nutritious breakfast may in fact be able to shift levels of stunting. Longer term assessments of stunting outcomes are recommended for this may confirm the changes observed across the two studies.

In particular a study which allows an assessment of stunting levels prior to the introduction of the breakfast programme and assessed again after a period of 1-2 years will be beneficial in confirming whether the breakfast programme does enable a shift in stunting rates. While this suggests that there may be positive returns on investments in breakfast at school level, it is also important to acknowledge that stunting is best addressed during early childhood. The higher rates of stunting at NSNP only schools are a cause for concern and the need for earlier investments in childhood nutrition to prevent stunting. This may mean coordinated efforts between the Department of Basic Education, the Department of Health and the Department of Social Development to ensure that children in the first three years of life, and those that attend early childhood development centres are targeted to eliminate stunting.

The lower rates of undernutrition across these schools, compared to national childhood rates of undernutrition 20 years ago (23% in 1994, Shisana et al., 2014) is testament to comprehensive national social policies, which include access to basic services and the wide reach of the Child Support Grant, aimed at reducing the effects of childhood poverty. Nevertheless, the fact that stunting levels are still high in South Africa points to the need for further interventions. The example of the public-private partnership that is highlighted in this study might point to ways in which the gaps that state interventions are unable to fill might be addressed.

The rates of obesity (measured both by BMI for age and body fat percentage) at the control school at the first data collection point were in line with the national average of 28.1% for children 2–14 years, and disconcertingly high for girls. It is pleasing to note that for both types of intervention schools: rates of obesity were far lower than the national average. 17% for schools receiving only the NSNP and 11.5% for schools receiving both the NSNP and TBF programmes. This finding demonstrates the effects of school nutrition for protecting children from being overweight or obese. It is also clear that the addition of a breakfast further reduces the risk of obesity for children. This latter finding is supported by the data from the study conducted in Alexandra which showed that levels of obesity were reduced over a ten month period after the introduction of a breakfast programme (Hochfeld et al., 2013).

The protective effects of nutritional programmes is further supported by the significant reduction in levels of obesity in the control schools after the introduction of the NSNP. The control group began receiving the NSNP meals directly after the first wave of data collection. At the posttest obesity levels in the control group had fallen by seven percentage points. This is quite a large reduction in a relatively short period of time. Literature on transitions out of overweight and obesity for children and adolescents in the context of school nutrition are largely focused on high income contexts (Affenito et al., 2013; James & Lock, 2008) and there is no evidence that the trajectory has occurred at the same speed in other middle or low income contexts. Thus it is a difficult to say with certainty what might explain such a reduction in obesity in these Eastern Cape schools. However we can cautiously state that the NSNP could have contributed to this shift. This suggests protective efforts of the NSNP for overweight and obesity and implies that a carefully managed, diverse, nutritious daily meal may be a key protective factor for managing childhood obesity. Further, an additional nutritious school meal in the form of a breakfast has added protective benefits. It also demonstrates that shifts in nutritional health are evident at the initiation of a school feeding programme and sustained over a longer period of time. These results strongly support the initiation of school feeding in rural disadvantaged schools. In addition, they imply that an important longterm contribution of school feeding is the consistency and stability of nutritional intake, which results in the retention of the gains made at the initial stage, rather than dramatic new changes.

The protective effects of the breakfast are particularly important for female learners in the study schools. Female learners at control schools displayed particularly high rates of obesity, and girls at schools receiving only the NSNP were more likely than their male counterparts to be overweight or obese. This was to be expected given that females are more vulnerable to being overweight than males. It is interesting to note that girls at schools receiving the NSNP and the TBF breakfast were as likely as their male counterparts to be overweight or obese and significantly less likely than girls at the other school types to be overweight. This suggests that the breakfast programme may have particularly positive effects on female learners. Future research should also account for physical activity levels which may be contributing to the differences between learners at the various school types, as well as between boys and girls.

Investments in nutrition during school years are important as “nutrition is foundational to both individual and national development” in economic, health, and human development terms (WICONG, 2013: 2). Broca & Stamoulis, (2003); Jomaa et al., 2011). From an economic point of view, protecting children from the cognitive effects of stunting is an important investment in future economic productivity. The data presented here seems to indicate potential to shift stunting levels in the schooling years, although further research is needed to confirm...
levels at the schools, resulting in enhanced energy, increased
and principals reported consistently that both programmes
directly shape learner performance. However, educators
school resources and teacher quality are all factors that more
be attributed to the programme since learner performance is
means that improvements in performance cannot necessarily
were that the programmes both resulted in significant and
involved was overwhelmingly positive. Their perceptions
and perform better. The experience of all stakeholders
infrastructure (especially adequate kitchen and storage
facilities), additional resources (such as more gas for cooking
breakfast from saved NSNP funds, and more money to
buy better quality food). Also, concerns about financial
management, monitoring capacity, and factors outside the
the control of the NSNP and TBF (such as persistent theft of food
stores) were raised. Reassuringly, none of these issues were
new to the NSNP officials, and in some cases they were
already searching for solutions. This indicates a sensitivity to
the everyday frustrations and limitations of the system.

Overall, the data suggest positive findings with regard to
undernutrition and obesity. Children at intervention schools
showed far better results for wasting and obesity than the
national average, and children at schools receiving the
breakfast programme had additional benefits in terms of
lower rates of stunting and obesity. This is pleasing given
that the Eastern Cape is a province particularly affected
by food insecurity. The data regarding obesity are especially
encouraging as they suggest that both nutrition interventions
act to protect children from being overweight or obese and
that the addition of a breakfast has clear additional benefits,
markedly for girls. It is important that stakeholders are aware
of the higher levels of obesity in control schools and this is a
key indicator to track over time. The learner performance data
shows that children at NSNP and TBF schools do better than
children at control schools and that those receiving breakfast
have higher marks than those receiving only the NSNP. It must
be noted that such differences cannot be attributed directly
to the programmes. However, stakeholders held very strong
perceptions that the interventions helped children concentrate
and participate, and better concentration amongst learners, as
well as improved attendance.

Stakeholders were particularly positive about the
complimentary effects of the TBF in combination with the
NSNP. TBF school stakeholders commented that these
benefits were experienced from the start of the school day
rather than midmorning which is when their NSNP meal
were served. Therefore the short term nutritional, performance
and attendance benefits have been observed by the school
community, even if these take longer to translate into better
school performance. It might be logical for future research in
this area to study concentration and participation levels in the
classroom rather than end of term grades as an indicator of
the nutritional impact on learners’ school performance.

Other benefits
Stakeholders identified a number of other benefits of the
feeding programmes, from benefits to the school and outside
community, to social benefits for the children themselves, or
their siblings. These included infrastructure and skills developments
at schools, the development of food gardens at school, the
opportunities for food handlers to earn a stipend, community
and family benefits when surplus food is given to vulnerable learners
to take home, improved nutrition literacy, and knowledge of
hygiene among learners. School stakeholders felt very positive
about the complementarity of the TBF and NSNP programmes,
and also mentioned other useful partnerships brought on board
through these programmes.

None of the schools indicated dissatisfaction with either
programme in principle, and they expressed enthusiasm and
gratitude for both these programmes. The two programmes
are very different in scale and in logistical management.
TBF can be complemented on very efficient management,
organisation, monitoring and delivery, as the schools had
almost nothing negative to say about this programme.

Concerns or complaints about the NSNP were not surprising
due to the complexity of delivering a three part meal to 8.8
million children daily. In this study, concerns mostly related
to infrastructure (especially adequate kitchen and storage
facilities), additional resources (such as more gas for cooking
breakfast from saved NSNP funds, and more money to
buy better quality food). Also, concerns about financial
management, monitoring capacity, and factors outside the
control of the NSNP and TBF (such as persistent theft of food
stores) were raised. Reassuringly, none of these issues were
new to the NSNP officials, and in some cases they were
already searching for solutions. This indicates a sensitivity to
the everyday frustrations and limitations of the system.

Taken together these findings provide a strong case both
for the continuation of the NSNP and the value of adding a
breakfast programme to all schools. However, the latter
suggestion should be treated with caution. Further research
is required to understand what is delivering the impact. Is it
the timing of the intervention, the type of nutrient intake,
or the combination of the breakfast and lunch programmes?
Before embarking on rolling out breakfast to all schools there
is a need to understand whether the same impacts could be
achieved through changes in the NSNP programme. In
addition, ensuring the delivery of a second meal has
significant cost and logistical implications. Taking on this
additional task may impede the ability of schools to effectively
deliver one meal. Where schools are not able to effectively
deliver the NSNP, addressing this should be the primary focus
rather than rolling out an additional programme. The study
does however indicate the positive effects of the breakfast
programme and these should be assessed further in order to
extend the benefit to other children in the area.

The partnership between TBF and the NSNP in the Luyanda
district is clearly one that works well and has positive effects
for learners. The model can inform partnership models that
might be able to extend the breakfast programme further.

Performance
With regard to the learner performance data, children at
the schools receiving the NSNP only and those receiving both
nutrition interventions had higher marks than those at control
schools in Term 1. Children at schools receiving the NSNP
and the TBF breakfast had significantly higher marks than
those in the control schools. By Term 4, the children at TBF
schools still had higher marks than those at the control
and those at NSNP only schools.

All schools in the study observed a significant increase in
their results over term 1 and term 4; this is to be expected
due to the complexity of delivering a three part meal to 8.8
million children daily. In this study, concerns mostly related
6. References


APPENDIX 1: Research instruments

In-depth interview guide for officials

THE TIGER BRANDS FOUNDATION & NATIONAL SCHOOL NUTRITION PROGRAMME EVALUATION RESEARCH

INTERVIEW GUIDE: Eastern Cape School Nutrition Programme and TBF officials

25 September 2014

Thank you so much for meeting with us. I am a researcher from the Centre for Social Development in Africa (CSDA), based at the University of Johannesburg. We have been asked by the Tiger Brands Foundation (TBF) to conduct an evaluation of the TBF school breakfast programme and the National School Nutrition Programme (NSNP) in the Lady Frere and Qumbu districts of the Eastern Cape. We want to know if these two feeding programmes are having a positive impact on:

- the nutritional status of learners
- learner performance
- learners’ school attendance and late coming
- the school and community more generally

We will be measuring 3 kinds of schools: those that started receiving the NSNP during 2014, those that have been receiving the NSNP for longer than a year, and those that have both the NSNP and the TBF programmes.

Our partners at the University of Fort Hare have been at these schools to take body measurements of your learners. This data will be used to assess the nutritional status of learners and how the school and community more generally respond to the programmes.

Before we start it is important to tell you that participation is voluntary so you don’t have to do the interview unless you want to. Also, if there are questions you don’t want to answer you don’t have to. We will not be using people’s names when we report on this research, so your answers will remain confidential. If we use your responses we will identify your position (official), but not your name. This information will be used in the report we deliver to the NSNP and the TBF as well as some academic journal articles that we will write on this research.

If you agree to the interview, we request to audio record our conversation. The recording is for research purposes and NOT for any form of distribution. The audio recording and interview material will be kept safely and confidentially in hard copy as transcripts in the CSDA offices at the University of Johannesburg and electronically. These materials will be destroyed by the CSDA after the usual storage length of 5 years.

DATE
SCHOOL

POSITION
NAME

I understand the above and have had a chance to ask questions. I agree to be interviewed.

SIGN

I agree to be audio recorded.

SIGN

INTERVIEWER NAME & SIGNATURE

START AND END TIME
BACKGROUND INFORMATION

1. Please tell us your name, title and what role you have in the School Nutrition Programme/ TBF programme.
2. What is the overall purpose of the programme?
3. What would you say are the long term social or developmental objectives of the programme? Probe: Trying to establish whether the programme is underpinned by a focus on educational outcomes, social security outcomes, nutritional outcomes, etc.
4. Does the programme achieve these objectives? Please explain.
5. Do you think a time will come when we will not need the NSNP and TBF anymore in South Africa? Please explain.
6. What monitoring and evaluation processes are you aware of in the programme?

FUNCTIONALITY OF THE PROGRAMME

7. What are the similarities and what are the differences between the NSNP and the TBF programmes? Probe: differences in feeding times, menus, cost.
8. What works well in the NSNP and what remains a key challenge? (Ask TBF AND NSNP officials)
9. What works well in the TBF and what remains a key challenge? (Ask TBF AND NSNP officials)
10. What reporting structures are there for your programme?
11. What impact have the feeding programmes had? Probe: For learners, for the School, for the Community, for Government, for TBF.

COLLABORATION

12. Who are the various role-players in running this programme that are external to the NSNP? Describe these relationships. Probe: Other government departments (e.g. health)
13. Other private / civic organisations
14. Partnerships
   If official is from the NSNP
   13.1. What has your experience been with working with TBF? Probe: Building of relationships extent of the partnership, etc.
   If official is from TBF
   13.2. What has your experience been with working with the NSNP? Probe: Building of relationships extent of the partnership, etc.
15. Do you have any further comments or questions?
**BACKGROUND INFORMATION**

15. How long have you been a principal and/or working at this school?

16. What quintile school is this?

17. Please describe the community which your school serves.
   
   **Probe:** Poverty / unemployment amongst parents  
   Levels of need  
   Income sources (e.g. grants)  
   Household size and composition  
   What kind of food availability / access do children have at home  
   General health and illness

18. Push-pull factors home vs school

18.1. What are the things that children like about school that encourage them to attend?
   
   **Probe:** company, motivation to learn, school feeding

18.2. What are the things that learners don’t like about school that make them want to stay away?
   
   **Probe:** distance to school, difficulties with learning, clashing with educators, bullying

18.3. What are the things that keep children at home or make it difficult for them to come to school?
   
   **Probe:** household or caring responsibilities, rain, illness, child mobility between households

18.4. What are the things that make them want to leave home to come to school?
   
   **Probe:** hunger at home, abuse at home, adult responsibilities

19. How is your school similar / different to other schools in the area?
   
   **Probe:** facilities (sports, computers, classrooms, furniture, library, toilets, food garden, playground)  
   Size and demographics  
   Leadership, management and staff quality

20. Have there been any big changes in your school during 2014?
   
   **Probe:** major infrastructure problems / upgrades, teacher strikes, empty / filled posts, tragedy at school, etc.

21. Existence of breakfast programme
   
   **[If school has TBF programme]**
   21.1. Has your school participated in any breakfast feeding programmes before the TBF project?
   21.2. Why do you think your school is part of the TBF programme?
   **[If school does not have TBF programme]**
   21.3. Do you have a breakfast feeding programme at this school (not TBF)? Please describe, including funding, implementation and functioning.

**FUNCTIONALITY OF THE PROGRAMME/S**

26. Operational issues

26.1. Describe how the programmes work

26.2. How many learners are fed daily (TBF / NSNP)?

26.3. How many school handlers do you use?

26.4. How long did it take until the feeding programme operated smoothly after the start of the programme?

26.5. What has worked well and what hasn’t worked so well – what would you change?

26.6. Do you have problems with getting the food for the NSNP programme?

26.7. Do you have the right facilities and skills at the school for buying, transporting, storing, preparing and serving the food?

26.8. Do the children wash their hands before eating? Do you think the facilities are clean enough for cooking?

27. Food preferences of learners (differentiate between TBF and NSNP)

27.1. What food do the learners like most on the programme?

27.2. What do they like least on the programme?

27.3. What food would the learners PREFER to have if they could choose?

28. Is the feeding programme initiative supplemented or linked to other initiatives? If yes, please describe.
   
   **Probe:** Take home or weekend food for very poor learners  
   Deworming of learners  
   The education of learners and parents on nutrition

29. How much has the feeding programme cost the school (money, staff time, etc.) in addition to what the NSNP and TBF has supplied?

30. What has been the response of different stakeholders (teachers, food handlers, parents, children and the surrounding community) to the school feeding programmes (differentiate between TBF and NSNP)?

31. Do you have any recommendations for TBF or NSNP?

32. Any further questions or comments?

**IMPACT OF THE FEEDING PROGRAMMES ON LEARNERS AND THE SCHOOL ENVIRONMENT**

22. Have you noticed a change since the implementation of the feeding programme(s) at your school?

23. How have the school feeding programmes affected the following?

23.1. Late coming?

23.2. Absenteeism / regular attendance?

23.3. The school’s enrolment figures?

23.4. Class participation? (Probe participation and concentration)

23.5. Learner performance at school? (Probe: grades better, children performing better in class)

23.6. Social interaction between learners?

24. Which learners would you say the school feeding programmes have benefitted the most and the least? (Probe for age, gender, grade, other)

25. If this is a TBF school: Can you differentiate between the impact of the TBF and the NSNP programmes? If yes, what are the differences? Are there any NEW changes that have happened since TBF was introduced?
In-depth interview guide for food handlers

CENTRE FOR SOCIAL DEVELOPMENT IN AFRICA

THE TIGER BRANDS FOUNDATION & NATIONAL SCHOOL NUTRITION PROGRAMME EVALUATION RESEARCH
INTERVIEW GUIDE: FOOD HANDLERS
26 September 2014

Thank you so much for talking to us. We are from the University of Johannesburg and the University of Fort Hare [Introduce individual interviewers and translator]. We are interested to hear what you think about the work you do as a food handler at school and what you think of the school meals.

Before we start it is important to tell you that participation is voluntary so you don’t have to take part unless you want to. Also, if there are questions you don’t want to answer you don’t have to. We will not be using people’s names when we report on this research, so your answers will remain secret. If we use your responses we will say you are a food handler but not the school you come from. We are also not going to tell the principal or educators what you say to us.

We encourage you all to talk, please try not feel shy because we are really interested in what each and every one of you think.

If you agree to the interview, please can we audio record our conversation. The recording is for research purposes and we will NOT give it to anyone. The audio recording and interview material will be kept safely and after five years we will throw it away.

<table>
<thead>
<tr>
<th>DATE</th>
<th>SCHOOL</th>
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<tr>
<th>POSITION</th>
<th>NAME</th>
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</table>

I understand the above and have had a chance to ask questions. I agree to be interviewed.

I agree to be audio recorded.

INTERVIEWER NAME & SIGNATURE

START AND END TIME
Focus group discussion guide

Thank you so much for coming to this group meeting. We are from the University of Johannesburg and the University of Fort Hare [Introduce individual interviewers and translator]. We are interested to hear what you think about the food you get at school. We will be talking about what you like and don’t like about the food, what food you eat at home, and how getting this food at school makes you feel.

Before we start it is important to tell you that participation is voluntary so you don’t have to take part unless you want to. Also, if there are questions you don’t want to answer you don’t have to. We will not be using people’s names when we report on this research, so your answers will remain secret. If we use your responses we will say you are a grade 6 learner but not the school you come from. We are also not going to tell your principal or educators what you say in this group.

We encourage you all to talk, please try not feel shy because we are really interested in what each and every one of you think. We would like to hear from everyone and not just from a few of you.

Do any of you have any questions?

47. Please tell us your names and how long you have been at this school.

48. Have there been any big changes that have happened here at school this year? Or what is the biggest thing that has happened at school this year?

   Probe: teacher changes, teacher strike, infrastructure collapse or improvement, tragedy

49. Have there been any big changes that have happened at home or in the community this year? Or what is the biggest thing that has happened at home or in the community this year?

   Probe: destructive storm or drought, community protests or violence, tragedies or hardship, infrastructure improvement or collapse, eg new road

50. Push-pull factors home vs school

50.1. What are the things that make you want to come to school? What do you like about school? (Probe: company, motivation to learn, school feeding)

50.2. What are the things that make you want to stay away from school? What don’t you like about school? (Probe: distance to school, difficulties with learning, clashing with educators, bullying)

50.3. Are there times when you want to come to school but you can’t? What are the things that keep you at home (away from school)? (Probe: household or caring responsibilities, rain, illness)

51. Do you think it is good to get food at school? Why?

52. What food do you like most?

53. What food don’t you like?

54. During the week do you normally eat more food at school or at home? Which food do you like better, food at school or food at home? Why do you say so?

55. What food is healthy or good for you? Why do you say this food is good?

56. What food is unhealthy or bad for you? Why is this food bad for you?

57. Impact of feeding programme [SKIP THIS QUESTION IN LADY FRERE NSNP SCHOOLS]

[Ask QUMBU SCHOOLS]

| S7.1 | Do you remember when the LUNCH (NSNP) feeding programme began at your school? | S7.2 | Do you remember when the BREAKFAST (TBF) feeding programme began at your school? |

[Ask TBF SCHOOLS]

[Ask S7.3 – S7.5 questions to only those who remember]

57.3. Have you noticed changes in you physically (in your body) since the feeding programme began?

   Probe: Do you weigh more? Do you feel stronger? More awake?

57.4. Do you think that there is a difference in how well you do at school since the feeding scheme began? If yes, please describe the difference before the feeding scheme began and since it started.

   Probe: Improvement in grades, concentration in class, participation in class

57.5. Has the feeding scheme changed anything about how you feel at school or about going to school now?

   Probe: Are you more excited to come to school now that there is a feeding scheme? Do you think you come to school more often or less often because of the feeding scheme? Does the feeding scheme change whether you are at school on time or not? Do you think you get sick more often or less often? Do you have more energy now or the same amount of energy or less?
64. Is there anything that you think the school should change about the food you get at school?
65. Is there anything else you’d like to tell us about your health or about the food you get at school?

---

**Nutritional questionnaire**

**National School Nutritional Programme and the Tiger Brands Foundation School Feeding Research: Eastern Cape, 2014**

**Dietary Questionnaire**

<table>
<thead>
<tr>
<th>Date</th>
<th>Grade / class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of field worker</td>
<td>Male / female</td>
</tr>
<tr>
<td>Name of school</td>
<td>Age</td>
</tr>
<tr>
<td>Name of child (for tracking purposes)</td>
<td></td>
</tr>
</tbody>
</table>

Hello. I come from the University of Fort Hare and we are visiting schools in this area to find out about the food that children eat. I would like to ask you a few short questions about WHAT YOU ATE YESTERDAY. I just want to know about yesterday, even if it is different from what you have eaten today. Please ask if there is anything you don’t understand.

1. Did you eat BREAKFAST yesterday?
   Circle the code for the correct answer
   - Yes 01
   - No 02
   - Don’t know 03

1.1. If yes, what did you eat?

<table>
<thead>
<tr>
<th>CODE</th>
<th>FOOD</th>
<th>DID YOU HAVE ENOUGH TO EAT?</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Cooked porridge at HOME (e.g. Mabele or Ace)</td>
<td>Fill in 01 for YES and 02 for NO</td>
<td>If you were confused or need to clarify anything write here.</td>
</tr>
<tr>
<td>02</td>
<td>Cooked porridge at SCHOOL (e.g. Mabele or Ace)</td>
<td>Fill in 01 for YES and 02 for NO</td>
<td>If you were confused or need to clarify anything write here.</td>
</tr>
<tr>
<td>03</td>
<td>Cold cereal at home (e.g. Kelloggs cornflakes)</td>
<td>Fill in 01 for YES and 02 for NO</td>
<td>If you were confused or need to clarify anything write here.</td>
</tr>
<tr>
<td>04</td>
<td>Bread or toast with Rama / butter / dry bread with no spread</td>
<td>Fill in 01 for YES and 02 for NO</td>
<td>If you were confused or need to clarify anything write here.</td>
</tr>
<tr>
<td>05</td>
<td>Bread or toast with something on top (e.g. peanut butter, cheese, jam) at HOME</td>
<td>Fill in 01 for YES and 02 for NO</td>
<td>If you were confused or need to clarify anything write here.</td>
</tr>
<tr>
<td>06</td>
<td>Bread or toast with something on top (e.g. peanut butter, cheese, jam) at SCHOOL</td>
<td>Fill in 01 for YES and 02 for NO</td>
<td>If you were confused or need to clarify anything write here.</td>
</tr>
</tbody>
</table>
1.2. If you ate porridge or cereal, did you add **milk or maas** to the porridge?  
Circle the code for the correct answer

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Yes</td>
</tr>
<tr>
<td>02</td>
<td>No</td>
</tr>
<tr>
<td>03</td>
<td>Don't know</td>
</tr>
</tbody>
</table>

1.3. If you ate porridge or cereal, did you add **sugar** to the porridge or cereal?  
Circle the code for the correct answer

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Yes</td>
</tr>
<tr>
<td>02</td>
<td>No</td>
</tr>
<tr>
<td>03</td>
<td>Don't know</td>
</tr>
</tbody>
</table>

2. Did you eat **lunch** yesterday?  
Circle the code for the correct answer

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Yes</td>
</tr>
<tr>
<td>02</td>
<td>No</td>
</tr>
<tr>
<td>03</td>
<td>Don't know</td>
</tr>
</tbody>
</table>

2.1. If yes, did you eat at **home**, or at **school**, or **both**?  
Circle the code for the correct answer

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Home</td>
</tr>
<tr>
<td>02</td>
<td>School</td>
</tr>
<tr>
<td>03</td>
<td>Both</td>
</tr>
<tr>
<td>04</td>
<td>Other (note down here)</td>
</tr>
</tbody>
</table>

2.2. What did you eat for **lunch**?  
Circle the code for the correct answer

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Amount</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Starch (e.g. pap, samp, rice, potatoes, pasta, bread)</td>
<td>1 or more</td>
<td>If you were confused or need to clarify anything write here</td>
</tr>
<tr>
<td>02</td>
<td>Protein (e.g. meat, chicken, fish, beans, cheese)</td>
<td>1 or more</td>
<td>If you were confused or need to clarify anything write here</td>
</tr>
<tr>
<td>03</td>
<td>Vegetables*</td>
<td>1 or more</td>
<td>If you were confused or need to clarify anything write here</td>
</tr>
<tr>
<td>04</td>
<td>Other (note down here)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>Don't know</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Did you eat **supper** yesterday?  
Circle the code for the correct answer

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Yes</td>
</tr>
<tr>
<td>02</td>
<td>No</td>
</tr>
<tr>
<td>03</td>
<td>Don't know</td>
</tr>
</tbody>
</table>

3.1. If yes, what did you eat?

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Amount</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Starch (e.g. pap, samp, rice, potatoes, pasta, bread)</td>
<td>1 or more</td>
<td>If you were confused or need to clarify anything write here</td>
</tr>
<tr>
<td>02</td>
<td>Protein (e.g. meat, chicken, fish, beans, cheese)</td>
<td>1 or more</td>
<td>If you were confused or need to clarify anything write here</td>
</tr>
<tr>
<td>03</td>
<td>Vegetables*</td>
<td>1 or more</td>
<td>If you were confused or need to clarify anything write here</td>
</tr>
<tr>
<td>04</td>
<td>Other (note down here)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>Don't know</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. What **fruit** did you eat yesterday? (prompts: at breakfast, at lunch, at supper, during school, snacks in between, before bed)

4.1. How many of each of these did you eat yesterday? (prompts: did you eat the whole fruit yourself? Did you share it with someone?)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Amount</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Apple</td>
<td>1 or more</td>
<td>If you were confused or need to clarify anything write here</td>
</tr>
<tr>
<td>02</td>
<td>Banana</td>
<td>1 or more</td>
<td>If you were confused or need to clarify anything write here</td>
</tr>
<tr>
<td>03</td>
<td>Mango</td>
<td>1 or more</td>
<td>If you were confused or need to clarify anything write here</td>
</tr>
<tr>
<td>04</td>
<td>Naartjie</td>
<td>1 or more</td>
<td>If you were confused or need to clarify anything write here</td>
</tr>
<tr>
<td>05</td>
<td>Orange</td>
<td>1 or more</td>
<td>If you were confused or need to clarify anything write here</td>
</tr>
<tr>
<td>06</td>
<td>Pear</td>
<td>1 or more</td>
<td>If you were confused or need to clarify anything write here</td>
</tr>
<tr>
<td>07</td>
<td>Pineapple</td>
<td>1 or more</td>
<td>If you were confused or need to clarify anything write here</td>
</tr>
<tr>
<td>08</td>
<td>Other (note down here)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>Don't know</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. What **vegetables** did you eat yesterday? (prompts: at breakfast, at lunch, at supper, during school, snacks in between, before bed)

5.1. Was it part of a meal or a single serving? (Explain: part of a meal e.g. spinach on pap; or beans and samp; or tomato on bread; single serving e.g. a whole carrot or tomato; tinned baked beans)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Amount</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Starch (e.g. pap, samp, rice, potatoes, pasta, bread)</td>
<td>1 or more</td>
<td>If you were confused or need to clarify anything write here</td>
</tr>
<tr>
<td>02</td>
<td>Protein (e.g. meat, chicken, fish, beans, cheese)</td>
<td>1 or more</td>
<td>If you were confused or need to clarify anything write here</td>
</tr>
<tr>
<td>03</td>
<td>Vegetables*</td>
<td>1 or more</td>
<td>If you were confused or need to clarify anything write here</td>
</tr>
<tr>
<td>04</td>
<td>Other (note down here)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>Don't know</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Please note that potatoes are not being counted as a vegetable in this study.*
<table>
<thead>
<tr>
<th>CODE</th>
<th>VEGETABLES</th>
<th>CODE</th>
<th>FOOD TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Tomato</td>
<td>01</td>
<td>Tea</td>
</tr>
<tr>
<td>02</td>
<td>Carrot</td>
<td>02</td>
<td>Coffee</td>
</tr>
<tr>
<td>03</td>
<td>Spinach (or Umfino)</td>
<td>03</td>
<td>Milk (if flavoured milk, indicate 'yes' with sugar)</td>
</tr>
<tr>
<td>04</td>
<td>Pumpkin or butternut</td>
<td>04</td>
<td>Fruit juice from a can or bottle or carton</td>
</tr>
<tr>
<td>05</td>
<td>Green squash / Gem squash</td>
<td>05</td>
<td>Cordial (juice you have to mix with water)</td>
</tr>
<tr>
<td>06</td>
<td>Cabbage</td>
<td>06</td>
<td>Cold drinks (eg Fanta, Coke)</td>
</tr>
<tr>
<td>07</td>
<td>Green beans</td>
<td>07</td>
<td>None</td>
</tr>
<tr>
<td>08</td>
<td>Dry / Sugar Beans (or Umngqusho)</td>
<td>08</td>
<td>1 small packet on my own</td>
</tr>
<tr>
<td>09</td>
<td>Baked beans from a tin</td>
<td>09</td>
<td>2 small packets on my own</td>
</tr>
<tr>
<td>10</td>
<td>Other* (note down here)</td>
<td>10</td>
<td>Shared 1 small packet</td>
</tr>
<tr>
<td>11</td>
<td>Don't know</td>
<td>11</td>
<td>Shared 2 small packets</td>
</tr>
</tbody>
</table>

*Please note that potatoes are not being counted as a vegetable in this study.

6. Did you eat any SWEETS yesterday?
Circle the code for the correct answer

| Yes   | 01   |
| No    | 02   |
| Don't know | 03   |

7. Did you eat any CHIPS yesterday?
Circle the code for the correct answer

| Yes   | 01   |
| No    | 02   |
| Don't know | 03   |

7.1 If yes to chips, how much? (Prompts: a whole packet, a shared packet, at home sharing a large packet)
Circle the code for the correct answer

| None   | 00   |
| 1 small packet on my own | 01   |
| 2 small packets on my own | 02   |
| Shared 1 small packet | 03   |
| Shared 2 small packets | 04   |
| Shared 1 large packet | 05   |
| More than above | 06   |
| Don’t know | 07   |

8. Did you have anything to drink BETWEEN meals yesterday that was NOT water? (between meals means do NOT record the drinks you have already noted above for mealtimes)
Circle the code for the correct answer

| Yes | 01   |
| No  | 02   |
| Don't know | 03   |

8.1 If yes, what did you drink and how much?

<table>
<thead>
<tr>
<th>CODE</th>
<th>FOOD TYPE</th>
<th>With Milk?</th>
<th>With sugar?</th>
<th>How many glasses / cups?</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Tea</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>Coffee</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Milk (if flavoured milk, indicate 'yes' with sugar)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>Fruit juice from a can or bottle or carton</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>Cordial (juice you have to mix with water)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>Cold drinks (eg Fanta, Coke)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX 2: Report on schools that dropped out of the study

Zote JSS
No data was collected from this school. During pretest data collection the roads were inaccessible and we could not get to the school to conduct the research.

KwaMhlontlo SSS
This was exclusively a high school and therefore out of the scope of this research which was to measure children between the ages of 6 and 14.

Tsawulayo SPS
We conducted measurements at this school for Pre-test but not for Post-test as they were in the midst of exams when we arrived. They said they would confirm a later time the following day but this did not happen.

Noxolo SPS
This school merged with another school, hence we went on to measure Rietspruit, which was not in the original selection, we obtained measurements from Rietpruit for Pre-test and Post-test.

Khanya JSS and Platkop JSS
These two last schools were closed on the 2nd October when we arrived to collect data (we did collect pretest data but deleted this after no data was collected for posttest). We obtained signed consent from the schools to collect data on the 2 October. Given the schedule for data collection we could not return at a later date to collect data.